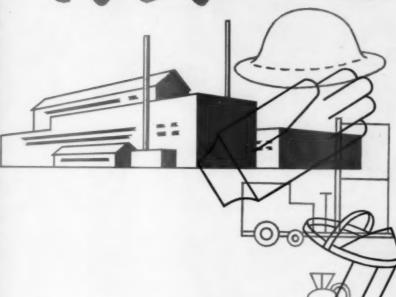
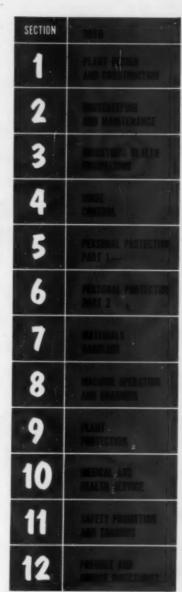
# SAFETY

A NATIONAL SAFETY COUNCIL PUBLICATION





23rd annual safety equipment issue





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# 23rd

# Annual Safety Equipment Issue

# NATIONAL SAFETY COUNCIL

Chartered by the Congress of the United States



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### A NATIONAL SAFETY COUNCIL PUBLICATION

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# **EDITORIAL**

# That Vital 15 Per Cent

FROM ITS BEGINNING, industrial accident prevention has been handicapped by the parrotted half-truth that safety is 85 per cent human and 15 per cent mechanical.

In defense of that position, it has been stated that many a plant continued to have accidents, even after all machines had been guarded. Investigation showed that practically none of the accidents could have been prevented by mechanical safeguarding.

Well, some of us can remember way back when safeguarding meant little more than covering up belts and flywheels. With that interpretation, the traditional human-mechanical ratio had more basis in fact. But if we expand safeguarding to include all the things that go to make up a well-designed, well-maintained plant with equipment to match, you have something that can't be figured in percentages alone.

Years ago at a National Safety Congress, a prominent safety leader (now deceased) told the audience with tears in his eyes that the State of Pennsylvania was making his company spend a lot of money for unnecessary guards—money that could be spent to better advantage for "education."

Since then his company has probably gone far beyond the state's minimum requirements for physical protection.

Nobody can estimate how much safety has been handicapped by neglect of the working environment but workers know there's something phony about a program that exhorts them to "Be Careful" in an ill-kept, unsafe plant.

This issue is devoted to that vital 15 per cent—or whatever percentage you wish to assign to safe surroundings. No safety program can function at normal efficiency if this aspect is neglected.

But the best equipment—safety or production—is useless unless men are trained in its use. So one section of this issue is devoted to training and communication methods and media.

This issue might be called an introduction to safety equipment—a book to be supplemented by more detailed works, such as the Council's Accident Prevention Manual for Industrial Operations, which has been included in the bibliographies on various subjects.

Yet even a general work of convenient size cannot provide all the information needed for many specialized operations. For such needs there are the publications of the American Standards Association, the National Fire Protection Association, the U. S. Department of Labor, and many other governmental agencies, as well as trade, professional, and technical associations.

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# Safety Gains in 1958

Report fewer fatalities for all classifications

THERE WERE approximately 13,300 deaths from work accidents in 1958, or 900 fewer than in 1957. Decreases were recorded in 6 of the 8 principal industrial groups; no change in 2.

For manufacturing, the death total was 1800 or 200 fewer than in 1957.

In agriculture, and mining, quarrying, oil and gas wells, fatalities also decreased 200 each to 3,300 and 700 respectively.

In contract construction, deaths decreased 100—from 2,500 to 2,400.

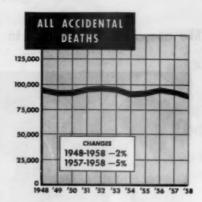
Deaths in trade and transport also went down 100 to 1,200 each.

For the other industrial groups, the 1958 death totals were the same as in 1957: service industries (including finance and government) 2,500 and public utilities 200.

Nonfatal disabling injuries totaled 1,800,000, or about 4 per cent less than in 1957. Permanent impairment cases numbered about 75,000.

Employment in all industries during 1958 was about 3 per cent less than in 1957; manufacturing employment went down almost 9 per cent.

Accident rates cannot be computed at this time on a national basis. Preliminary information indicates that the all-industry frequency rate probably was slightly lower than in 1957. Nonfatal injuries, as noted above, were fewer



than in 1957. Employment was down 3 per cent, and average hours worked per week were also down, resulting in less exposure than in 1957.

Accident Costs. Wage loss, medical expense, and the overhead costs of insurance for work accidents in 1958 amounted to about \$1,950,000,000. The so-called "indirect" costs are estimated at \$1,900,000,000. These include such items as time lost by workers other than the injured, time lost by workers whose injuries were not serious enough to be classified as temporary total disabilities, interference with production schedules and property damage. Total costs were about \$3,850,000,000.

Off-the-Job Accidents. In addition to work accidents, off-the-job accidents to workers lowered the nation's productive capacity. The 1958 death toll from these accidents was approximately 28,500 and the disabling total about 2,200,000.

Accidents to workers on and off the job totaled 41,800 deaths and 4,000,000 injuries. Time lost during the year from these accidents (including indirect losses) amounted to approximately 275,000,000 mandays.

Fire Loss. The 1958 total of property destroyed by fire was \$1,056,000,000, according to the National Board of Fire Underwriters. This was 3 per cent more than the comparable 1957 total. In 1957 nearly half of the loss from building fires was in industrial and business establishments.

Industrial Commission Records. Deaths reported to the Industrial Commissions in 22 states during 1958 totaled 6,663, or 6 per cent less than in 1957. Decreases of 3 to 39 per cent were recorded in 15 states; increases of 3 to 26 per cent occurred in 7 states.

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Arizona 77 83 — California 1,060 1,032 + Connecticut 69 67 + Florida 254 201 +2 Georgia 232 221 + Idaho 76 74 + Illinois (9 mos.) 194 236 —1 Kentucky 64 85 —2 Massachusetts 548 566 — Missouri 74 85 —1 Nebraska 71 81 —1 New York 1,480 1,598 — North Carolina 114 158 —2 Oregon 120 129 — Pennsylvania 639 771 —1 South Carolina 81 85 — Texas 654 709 — Virginia 200 194 + Washington 220 215 + West Virginia 274 312 —1	Totals for 22 states	6,663	7,111	- 6
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Virginia         200         194         +           Washington         220         215         +           West Virginia         274         312         -1	South Carolina	81	85	- 5
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West Virginia 274 312 -13	Virginia	200	194	+ 3
West Virginia 274 312 -13	Washington	220	215	+ 2
Wisconsin 102 111 -		274	312	-12
	Wisconsin	102	111	- 8

# THE NATIONAL ACCIDENT FATALITY TOLL

	1958	1957	% Change
All Accidents	91,000	95,307	-5
Motor-Vehicle	37,000	38,702	-4
Public Non-Motor-Vehicle	16,500	17,500	-6
Home	27,000	28,000	-4
Work	13,300	14,200	-6

Note: The motor-vehicle totals include some deaths also included in work and home totals. This duplication amounted to about 3,200 deaths in 1957 and 2,800 in 1958. The 1957 all-accident and motor-vehicle death totals are the official figures of National Office of Vital Statistics; all others, National Safety Council estimates.

# When the Employee Is a Customer

Treat him like one, if you want him to wear protective equipment

GETTING an employee to use safety equipment on the job is a sales proposition. It doesn't make any difference whether he pays for it or the company issues it free.

Often the employee's first contact with the safety program is when he is taken to the safety store to be outfitted. His attitude may be influenced at the start by the store, the stock and the attendant.

The stock room should be neat, clean, orderly, and presentable. Its appearance will have a marked effect on the employees' acceptance of equipment. No one likes to think of wearing respirators that have been stored in a room where poor housekeeping is conspicuous.

From a morale standpoint, it is desirable to clean, sterilize, and repair dirty or worn-out equipment as needed, and always before use by another person. Some plants have an employee who moves throughout the operating areas—cleaning, sterilizing, and adjusting safety devices, such as goggles, respirators, etc.

Other items could more conveniently be cleaned and reworked at a central point where spare parts are available. Manufacturers can usually furnish instructions for repairing and cleaning personal protective equipment.

Low-cost items used in considerable quantities can be most conveniently issued at the various manufacturing areas. More expensive or specialized equipment should be stocked and issued at a central point, so a minimum working stock can be maintained. Authorization for its withdrawal should come from the worker's immediate supervisor, since he is in a position to maintain a watch over consumption and prevent needless waste.

Adequate supplies of various items in a well-assorted range of sizes should be kept in stock. A



competently supervised marker system is usually satisfactory for assuring adequate supplies. When a new employee—or an old one—is sent to the store for equipment essential to his job and none is in stock, his attitude toward equipment is likely to be affected. Of course, shortages will occur occasionally, even with good management, but they should not become chronic.

Ill-fitting equipment will also cause resentment, in addition to being uncomfortable and offering less protection.

The attendant is scarcely less important than the store and stock. He can make friends for the safety program by knowing his equipment, being friendly to the employee and taking pains to see that he is satisfied. With clothing, particularly safety shoes, he should be able to do a competent job of fitting.

# **Approaching the Problem**

For many manufacturing plants, determining the protection worn in

various departments is relatively simple. It becomes more complicated where there are diversified operations and severe exposures, such as high temperatures and toxic materials.

First, make a comprehensive survey of the plant to establish the requirements of each department. Watch changes in operating conditions and other variable factors that might result in new requirements.

After requirements for protective equipment have been determined, explain the facts to supervision and the man on the job. Try this approach:

- 1. Specify equipment for an entire area. For example, anyone entering an acid manufacturing plant must wear chemical-type goggles, or all persons working in warehouses must wear safety shoes.
- List required equipment for general categories, such as wearing rubber or plastic gloves and splash-proof goggles for all acid-handling operations

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# "FEDERAL SPECS"

# **Uncle Sam's Shopping Guide**

NAME almost any commodity, and it's a sure bet that some agency of the Federal Government uses it, and there are specifications that must be met by anybody who wants to sell it to the government.

There are more than 1,200 of these specifications—"Federal Specs" as they are popularly called. Products covered range from pickled pigsfeet to 10-ton trucks.

Among the items are many with direct and indirect applications to safety and health, including personal protective devices, fire protection apparatus, sanitary supplies, and materials handling equipment. Prices for specifications range from 5 cents to 60 cents a copy.

Issued primarily for the guidance of government agencies, the specifications may be purchased by any interested persons or organizations. An Index of Federal Specifications, Standards and Handbooks is available on a subscription basis at \$1.75, which includes supplements as issued. Both the Index and individual specifications are for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Specifications are widely used by those bidding on government orders and by those who are interested in setting up their own purchasing procedures.

Preparation. The Federal Supply Service, General Services Administration, develops standard purchase specifications and policies governing the purchase of materials and equipment. For items involving safety factors, the Federal Supply Service has the cooperation of the Protection Division of The Public Buildings Service, GSA, and many other governmental agencies and non-governmental organizations.

The compilation of standards and specifications, however, is the work of many minds and organizations with a vast background of experiOF
FEDERAL SPECIFICATIONS, STANDARDS
AND HANDBOOKS

CUMULATIVE MONTHLY SUPPLEMENT TO INDEX
DATED JANUARY 1, 1938

DECEMBER 1, 1958

GENERAL SERVICES ADMINISTRATION
FEDERAL SUPPLY SERVICE

ence. Prominent among these is the Federal Safety Council, an advisory body on the safety of civilian employees in Federal Service. Established by Executive Order in December 1950, it has been valuable in coordinating the safety activities of various governmental branches which had been growing steadily in scope and effectiveness since World War I.

The Council carries on some of its activities through committees of safety officers drawn from the several agencies. One of these activities is the drafting of specifications for many types of safety equipment. Each draft is submitted to the Specifications Branch of the Federal Supply Service, which reviews it and,

if approved, promulgates it as a regular Federal Specification.

Of far-reaching influence is the Bureau of Labor Standards, which is primarily a service agency to state labor departments and organizations and individuals interested in the improvement of working conditions, including promotion of safety and health. It produces much technical and informational material.

The Bureau of Mines is widely known for its promotional activities for safety and health in the mineral industries. The Bureau has been a world leader in research and education in the area of toxic materials and respiratory protective devices. Its research publications are authori-

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# WIRE FROM WASHINGTON

# By Harry N. Rosenfield

Washington Counsel, National Safety Council

This report is an information service. It does not imply National Safety Council approval of or opposition to legislation mentioned

SAFETY has become a principal battleground in Washington.

President's messages. The President's budget message dealt with several general safety matters. He promised to send to Congress proposed legislation to recognize the responsibility of state governments for cooperating with the federal government in protecting the public from threats to health and safety in the peaceful uses of atomic energy.

And he announced he had directed the Secretary of Commerce to undertake a comprehensive study of national transportation, including the shipping industry, to identify emerging problems, redefine the appropriate federal role, and recommend appropriate legislative and administrative action.

On the other hand, S. Res. 29 (Magnuson and Smathers) would authorize a Senate committee to study transportation policies, including the need for, and type and character of, federal regulation of transportation.

Aviation safety. The Senate and the President clashed over alternative proposals to extend the Federal Airport Act, which expires June 30, 1959. Originally enacted in 1946, and twice reviewed, the program authorized federal grants for the construction and development of civil airports.

The President sought a diminishing program in S. 674, proposing 200 million dollars in airport fund grants this year. In addition, the administration planned an expenditure of more than 2 billion dollars in the next four years, of which 500 million dollars is to be spent this year, in air safety facilities entirely apart from airport aid.

The Senate passed S. 1, authorizing an annual expenditure of 465 million dollars for airport construction purposes, and its discussion revolved, in part, about safety in air travel. The President vetoed a substantially similar bill last year.

The report of the Senate Committee on Interstate and Foreign Commerce regarded S. 1 as necessary, because of the "immediate critical need" owing to the "rapidly mounting volume of air traffic,' and the "revolutionary changes in airline services resulting from the use of jet aircraft."

The committee noted the rise in air traffic from 12 million airborne passengers in 1946 to 50 million in 1958, and an expected 118 million in 1970, with air freight quadrupling from 1946 to 1957.

Although the committee gave a "higher priority of need" to "ground facilities . . . which bear a direct relation to the safety of our interstate air traffic," its bill also allowed

for certain kinds of airport terminal facilities.

The President objected to S. 1, because it went beyond safety requirements. He preferred his program which "directs itself to one factor and one factor only, improving the safety of flying, whether it is in the air, take-off, or when you arrive." The President would leave the construction of other terminal facilities to the local communities.

The House Committee on Interstate and Foreign Commerce held hearings on HR 1011 (Harris) and HR 3267 (Bennett), likewise intended to extend the Federal Airport Act.

A commercial aircraft accident in New York City resulted in immediate Congressional, as well as administrative, activity. The full House Committee on Interstate and Foreign Commerce initiated an inquiry into air safety, which is to be carried on by a special subcommit-

The investigation will deal not only with the particular accident but also with the over-all safety problem of transition to prop-jet and jet planes. Equipment and training will also be surveyed.

Various bills sought to strengthen air safety controls. HR 4180 (Bosch) would fine violations of civil air safety regulations. HR

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# THE MONTH IN WASHINGTON

- President promises legislation pinpointing state-federal responsibilities for cooperation in protecting public from atomic energy hazards.
- Legislators investigate over-all safety problems of transition to prop-jet and jet aircraft. Equipment and training to be surveyed.
- Air Force, AEC form Life Sciences Working Group to study human factors in nuclear propulsion of aircraft and missiles.
- Senators seek removal of exemption granted to smaller mines by Federal Coal Mine Safety Act.

# THE DIARY OF A SAFETY ENGINEER



(Fiction)

A series of minor accidents draws attention to defects in the personal protection program—also to the fact that the safety men are going around the shop without adequate protection

# **Equipment for Safety Men, Too**

# By BILL ANDREWS

March 2, 1959

THE OLD SNOW BANKS are thawing, and the transit and level crews are working in two or three locations on the project in anticipation of good building weather soon.

And in the dismal, tag end of winter, we've been having a run of minor accidents, which has had us working overtime in investigation and intensified work with the foremen.

This afternoon I had a session with supervisors at the Hartily Company shop talking safety equipment.

One case in that shop recently involved eye injury—and the machinist who caught the steel splinter had his goggles around his neck when he was hurt. Fortunately, good medical work and good luck combined to keep the disability trivial, but the case brought out a host of complaints in the shop against the eye protection provided.

The man's goggles were old, and the lenses were scratched. Also, the fit was bad, and the goggles were uncomfortable. As a result, the man had gotten into the habit of wearing them only when he was doing something especially hazardous, like grinding, or when his foreman was right on top of him to enforce the rule that the goggles be worn during all machine operations.

I checked the rest of the shop and found a pretty generally unsatisfactory situation—both as to the equipment and enforcement of its use.

I tried his goggles myself, and I could understand his temptation to do without them. In fine work, the scratched lenses seriously interfered with vision. I'm pretty sure that if I wore those goggles all day, I'd have a headache.

Correction of the trouble followed obvious lines. But it was a slow and laborious job to really sell the superintendent on re-equipping the shop with a new, tailor-made eye protection line, and to sell the foremen on the need and practicability of arousing genuine enthusiasm among the men for the proper use of eye protective equipment to be provided.

In the same shop last month a man dropped a tote box of machine parts on his foot, breaking a small bone, and laying him up for a week. It was an ordinary enough kind of accident, but it presented special problems, because the man was wearing safety shoes. The man was complaining because the protective shoes didn't prevent the injury, and his fellow workers (and even some foremen) were questioning the value of the shoes.

Logically, the answer was simple. Nothing short of an armored boot, reaching above the ankle, would have prevented this particular injury, and the hazards of the shop certainly didn't justify use of such a boot

But I had to dig around in the files and come up with a number of cases in similar shops on the project in which safety shoes prevented crushing injuries to toes, before I could feel we restored any confidence in or support for a safety shoe program.

Finally, the same shop had a very minor fire recently, and the fire extinguisher first used did not work. Again, there was a simple answer—the shop had no regular system for maintaining extinguishers, and the one in question hadn't been checked for 18 months.

In addition, it was a cut-rate piece of substandard junk to start with—though I couldn't tell the foremen that.

To them I spoke sternly about the need for regular checkups, but to the superintendent and his purchasing agent I told another and a harsher story about the immorality of saving nickels at the risk of lives and property.

I went away from that meeting with my mind focused on the problem of safety equipment. And then I began to wonder about the equipment of my own department.

When I stopped and thought about it, I realized that I equipped the safety department on a rather hit and miss basis—very much more hit or miss than I would recommend for any production department.

So I checked my own and my

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# Learning to Live With the Atom

We can't escape radiation—either natural or man-made but science has learned a lot about its control.

ATOMIC ENERGY occurs everywhere in nature, and all materials are radioactive to some degree. People are constantly exposed to various kinds of radiation, such as ultraviolet and infrared rays of the sun and cosmic rays from the sky, in addition to radiation from radioactive substances.

active substances.

Radiation is biologically harmful only when uncontrolled and too intense for the body to tolerate. This is also true of electricity and of other kinds of radiant energy. But much has yet to be learned about the full biological effects of atomic radiation. Permissible dosage rates as published should not be accepted as implying that lower radiation levels are completely safe.

Peaceful uses of atomic energy include power, heat, medical therapy, and process control by isotopes—the use of radiation and tracing techniques. It is with the latter use that industry is most concerned. The radioisotope program is vast and is growing rapidly. Most industries are finding important uses.

The ultimate use of radioisotopes can hardly be realized. Two obstacles to their use are the amount of shielding required where atomic energy is used—usually no insurmountable difficulty in control operations or tracer techniques, and the problem of disposing of radioactive wastes—the major trouble.

To meet the safety needs of this huge development, the Atomic En-



RADIATION SYMBOL of magenta against a yellow background is used on a warning tag on a locked door at Oak Ridge Laboratory.

ergy Commission strictly enforces safety regulations in its own installations. Further supervision involving non-AEC installations is accomplished by safety inspection prior to the issue of licenses to users of large amounts of radioactive materials. These licenses are also subject to annual inspection—and possible revocation—by the AEC for inadequate safety measures by the licensees. Safety is further promoted through education of users.

Types of ionizing radiation, among other sources, include:

- 1. Gamma rays, as from cobalt 60.
- Alpha particles, as from polonium.
- 3. X-rays.
- Neutrons, as from a radium beryllium source.

X-ray, gamma rays, and cosmic radiation are electromagnetic phenomena similar to visible light but of higher frequency and, therefore, more penetrating. The other types are moving charged particles. All are capable of causing injury to the body.

Injuries produced are qualitatively the same. There are quantitative differences due to varying intensity, penetration, and ionizing ability.

Types of injury. Eight general types of injury from exposure to excessive amounts of radiation have been recognized.



TECHNICIAN prepares to leave hot cell after testing it for radioactive materials. He carries radiation monitor to measure intensity of radioactivity in cell and to protect himself from possible overexposure. Forced fresh air is supplied through mask from compressor outside. Clothing includes coveralls, head covering, plastic shoe covers and two pairs of gloves. Cell door is of steel 11 in. thick. On opposite side is glass window 36 in. thick. (Westinghouse Bettis Hot Laboratory.)



CHECKING worker for contamination at Oak Ridge National Laboratory. A hand and foot counter is used, also a GM probe tube for clothing.

- 1. X-ray dermatitis.
- 2. Induction of tumors.
- 3. Leukopenia.
- 4. Leukemia.
- 5. Anemia.
- 6. Bone necrosis.
- 7. Glandular dysfunction.
- 8. Fetal injury.

X-ray dermatitis is a common result of exposure to almost any radiation. It is characterized by rough, dry skin, wart-like growths, and dry, brittle nails.

Bone necrosis is very similar in form and in causation to the dermatitis. It has often been produced by overexposure to medical fluoroscopes, primarily through failure of radiologists to wear personal protection.

These types of injury are probably most commonly produced by local irradiation of tissue with a comparatively concentrated dosage.

The other types are more apt to be produced by whole body irradiation at lower levels during a longer period. These conditions are apt to develop insidiously in industrial use and may be overlooked until serious harm has been done.

Leukemia is the most studied of these conditions. Radiation anemia due to damage to bone marrow has been studied closely as one of the results of whole body irradiation in atomic bomb blasts.

Tolerance doses. Limits prescribed by the AEC govern exposure of workers to external radiation, concentrations of radioactive material which may be discharged into air and water, and disposal of radioactive wastes.

The standards established by this regulation (10 CFR, Part 20, "Standards for Protection Against Radiation") became effective February 28, 1957.

The standards agree substantially with those published by the National Committee on Radiation Protection in NBS Handbook 52, Maximum Permissible Amounts of Radioisotopes in the Human Body and Maximum Permissible Concentrations in Air and Water, and NBS Handbook 59, Permissible Dose from External Sources of Ionizing Radiation.

The radiation symbol, devised by the AEC, consists of a 3-bladed design in purple or magenta against a yellow background. Accompanying words describe the nature and seriousness of the exposure.

# **Protective Measures**

Methods of keeping external radiation down to a reasonable value are:

- 1. Keeping personnel a sufficient distance from the source.
- 2. Shielding the source
- 3. Reducing time of exposure.

The standard shielding material against x-rays and gamma rays is lead. However, it is often more convenient to use other building materials as shields, particularly with x-rays from sources of relatively low intensity, and cheaper to use other materials for shielding sources of very high intensity.

Personnel monitoring. Employees working around sources of radiation should carry personal monitoring devices, such as film badges, pocket dosimeters, or film rings.

These devices are available from a number of commercial organizations which take responsibility for reading them and providing a permanent record of the exposure received by each individual.

Laboratory monitoring. Areas and equipment are checked with an ionization type of survey meter for contamination with alpha and beta emitters and with a Geiger counter for gamma radiation. Alpha and beta emitters are especially dangerous as sources of internal radiation.

Coats, trousers, and shoes and operators' hands are monitored daily. Garments showing activity beyond a specified level must not be sent to a commercial laundry.

With these devices and procedures it is possible to determine the radiation dose to any person. Conditions can then be adjusted to keep the dosage within conservative tolerance levels.

# **Radioactive Wastes**

Disposal of waste materials is one of the serious problems in connection with the use of radioactive ma—To page 168

# RADIATION PRECAUTIONS

- 1. Plan equipment so as few persons as possible will be exposed.
- 2. Make maximum use of protection, including distance.
- 3. Use remote controls wherever required.
- Shield and mark plainly all radiation sources.
- 5. Where there is danger of inhalation, ingestion, or contact with gases or dusts, see that there is:
- a. Effective exhaust ventilation with proper exhaust filter equipment.
- Personal and environmental cleanliness.
   Protective equipment such as respirators and goggles.
- d. Segregation of processes.
- e. No eating, drinking, or smoking in areas where there is a possibility of contamination from radioactive materials.
- Close supervision of all personnel by qualified technicians. Include routine surveys, complete records, calibrated monitoring, and instruction of workers.
- Be sure workers and others entering radiation areas use the necessary personnel monitoring devices, and keep careful check on individual records.
- 8. Provide periodic medical examinations of all persons employed in radiation work. Encourage prompt reporting of skin affections or other symptoms that might indicate radiation damage.
- Keep permanent records of film badge readings (retain developed film), dosimeter readings, and radiation survey results.

# Make Plans Before Disaster Strikes

Preparedness will prevent much confusion and loss from man-made catastrophes or nature on the rampage

TO SAVE lives and property and to restore productive capacity to a plant after a disaster, develop a plan that doubles as a peacetime emergency program or a civil defense operation.

The purpose of such a plan is to direct workers to safety, rescue trapped persons, give first aid, repair damaged water mains and utility lines, fight fires, keep morale up, demolish unsafe structures, clean up the premises and restore the plant to its productive ability.

Civil defense. Contact the local civil defense director, and dovetail plant emergency plans with the available CD setup. Arrangements also should be made with neighboring industrial groups for mutual aid.

Make provisions to lend each other fire-fighting, demolition, and

first-aid equipment. Put duplicate lists of equipment at member plants on file in the offices of each plant's security chief. Arrange for an exchange of established emergency services, such as warden, medical, and fire.

The Federal Civil Defense Administration has on hand useful publications that can be slanted to the indvidual or mutual-aid plan's needs.

Coordinator. Choose a coordinator who has the confidence of management and the work force and who can take complete charge, without divided authority, in an emergency situation. For specialized information he can call on outside consultants, such as representatives of casualty and fire insurance underwriters.



EMERGENCY RESCUE CREW is on the job taking care of the "victims" of a simulated disaster. Industries in the Linden, N. J., area, through the Linden Industrial Mutual Aid Council (LIMAC), have trained men and modern equipment ready to rush to the scene in case of emergency.



POWER MEGAPHONE carries instructions above noise of pumper and other sounds in directing remote fire fighters. Unit can be hand held for short emergency messages or carried over shoulder for prolonged, detailed transmission. (Motorola.)

Make a survey of plant buildings and shelter requirements. Any area selected as potential shelter should be in the center of the building, away from outside exposure. "Outside" includes courts and light shafts

Areas should be in a part of the building that is structurally compact, with close spacing of columns and short-span beams. They should be out of direct line with doors, windows and hallways exposed to the outside. Walls and doors surrounding the area should be free of glass.

Stairways. There should be at least one interior stairway, not adjoining an outer wall. Areas should contain no furnaces, or boilers, and no large steam, water or gas pipes. The ceiling should not be of the hung or suspended type, or have heavy lighting fixtures or plaster ornaments.

The area should be as free as possible of furniture, stored merchandise or equipment of any kind. There should be no safes, banks or filing cabinets or heavy machinery on the floor above.

Hallways, corridors, fire stairs, rest rooms and elevator lobbies in the center of buildings are good locations, if free of glass.

Choose, instruct and assign emergency protection personnel: ward—To page 120

# A NATIONAL SAFETY COUNCIL TECHNICAL SERVICE

# METHYLENE CHLORIDE (Dichloromethane)

Published by the National Safety Council 425 North Michigan Ave., Chicago 11, III.

1. Methylene chloride (CH<sub>2</sub>Cl<sub>2</sub>) is a colorless volatile liquid with an odor similar to that of chloroform. It is miscible with ethyl alcohol and ethyl ether. It is not considered corrosive to metal at normal temperatures, but at high temperatures, such as occur in open flames or open electric heaters, it will decompose to form hydrochloric acid, which is corrosive.

2. Useful conversion factors are: 1 milligram (mg) of methylene chloride dispersed in 1 liter of air is equivalent to 288.2 parts per million (ppm) in air; 1 ppm of methylene chloride in air is equivalent to 3.48 mg of methylene chloride per cubic meter of air at 25 C and 760 mm Hg.

# **Properties**

Some properties of methylene chloride are listed below.

Specific gravity: 1.336 in the range of 4 C (39.2 F) to 20 C (68 F)

Boiling point (760 mm): 39.8 C (103.6 F)

Freezing point: -96.7 C (-142.1 F)

Flash point: nonflammable (Underwriters' Laboratories rating)

Fire point: nonflammable

Vapor pressure: 420 mm Hg at 25 C (77 F); 8.12 psi at 25 C (77 F)

Vapor density: (760 mm) 3.30 grams per liter or 0.206 lb. per cubic ft.

This Data Sheet is one of a series published by the National Safety Council, reflecting experience from many sources. Not every acceptable safety procedure in the field is necessarily included. This Data Sheet should not be confused with American Standard Safety codes, federal laws, insurance requirements, state laws, rules and regulations, or municipal ordinances.

Molecular weight: 84.94

Specific gravity of vapor: 2.93 (air

Refractive index: 1.4237 at 20 C (68 F)

Percentage of CH<sub>2</sub>Cl<sub>2</sub> present in air saturated with CH<sub>2</sub>Cl<sub>2</sub>: 79.3% by weight (approximately 70% by volume) on 3.87 lbs. CH<sub>2</sub>Cl<sub>2</sub> per lb. of dry air at 25 C (77 F)

Pounds per gallon: 11.07 at 20 C (68 F)

Diffusivity in air: 0.091 square centimeter per second at 25 C (77 F) and 1 atmosphere

Solubility in water: 1.32 grams per 100 grams H<sub>2</sub>O at 25 C (77 F)

Solubility of water in CH<sub>2</sub>Cl<sub>2</sub>: 0.170 gram water per 100 grams CH<sub>2</sub>Cl<sub>2</sub> at 25 C (77 F)

## Uses

 Methylene chloride is used as a degreaser in diphase cleaning and paint stripping, as a constituent of paint and varnish removers, as a solvent in extraction processes, as a secondary refrigerant, as a solvent for resins and plastics, and as the vehicle for insecticide aerosols. It replaces other costlier vehicles because of its high solvency, stability, and low corrosiveness.

5. Use of methylene chloride with petroleum distillates lowers the flammability hazards, and it acts as a pressure depressant when used with other vehicles such as dichloro-difluoromethane. The use of methylene chloride in aerosol packages does not present any special problems. Routine precautions to prevent contact with the eyes, respiratory tract, and skin are desirable.

6. The excellent solvent power, nonflammability, and low toxicity of methylene chloride recommend it for consideration as a replacement for some of the older solvents. Although it will not do all jobs with equal satisfaction, in most cases its use can be tailored to specific operations. It must be realized, however, that its low boiling point (approximately room temperature in some shops) and relatively high vapor pressure under many shop conditions will cause rapid formation of high atmospheric concentrations.

## Health Hazards

7. Like all solvents, methylene

chloride is toxic. It is one of the least toxic of the chlorinated hydrocarbons, but prolonged exposure to high concentrations may result in unconsciousness or even death.

- 8. Methylene chloride is, however, rapidly eliminated from the body, and the usual symptoms of over-exposure disappear quickly in fresh air, with no permanent effects on the normal heart, liver, or kidneys. There is no evidence that continued exposure to low concentrations of methylene chloride vapor can result in damage to healthy organs.
- 9. Methylene chloride, being a solvent, will extract oil from the skin, resulting in dryness, cracking, and in some cases infection. It is also possible for methylene chloride or its vapors to be absorbed through the pores, with the same physiological effects as those produced by inhalation.
- 10. Liquid solvent splashed into the eyes is probably the most serious exposure in normal industrial use. The injury is usually more or less painful and irritating, but apparently does not cause serious or permanent effects.
- 11. Though ingestion of methylene chloride is not usually considered a significant industrial hazard, serious illness may result if an appreciable quantity of this material is swallowed.

# Maximum Acceptable Concentration

12. Authoritative groups such as the American Conference of Governmental Industrial Hygienists suggest that the maximum acceptable concentration for continuous eight-hour daily exposure to methylene chloride be 500 ppm.

# Fire and Other Hazards

13. Since methylene chloride is not flammable at ordinary temperatures, it presents no hazard of fire or explosion in air. Under favorable laboratory conditions and at higher temperatures (1,224 F), it is capable of forming weakly combustible mixtures with air. The explosive limits when CH<sub>2</sub>Cl<sub>2</sub> is mixed with pure oxygen are 15.5 per cent to 66.9 per cent by volume.

- 14. Methylene chloride is stable in the presence of all the common engineering metals, including ordinary grades of iron and steel, tin (dipped or plated), brass, bronze, copper, lead, zinc, and galvanized iron. Since methylene chloride is corrosive to aluminum and magnesium, these metals are not satisfactory as construction materials for equipment handling this solvent.
- 15. Contact with an open flame, incandescent metal, or incandescent ceramic surface will cause methylene chloride to decompose. Hydrogen chloride and phosgene may be formed in concentrations high enough to be toxic and corrosive. In the presence of wood fires and with an initial concentration of 5.7 per cent methylene chloride by volume, phosgene concentrations of 580 parts per million have been observed.\* The threshold limit value for phosgene is one part per million.

# **Shipping Regulations**

16. The Interstate Commerce Commission does not recommend any specific shipping regulations for methylene chloride.

# Storage

- 17. For operations requiring limited amounts of methylene chloride, a single drum on a drum dolly, with dispensing facilities, is usually adequate for storage purposes.
- 18. If more than one drum is kept on hand, each should be opened as needed. When drums are received, bungs should be checked for tightness, and "leakers" should be rejected or the contents transferred to sound drums.
- 19. A separate storage area for the drums should be provided. Since methylene chloride boils at approximately 104 F, both its vapor pressure and rate of evaporation may be appreciable in an atmospheric pressure tank during warm summer months. A cool location

should be selected for the storage

- 20. Drums may be stored horizontally or on end. On-end storage in lines two deep, with aisles between them, is usually less expensive and permits easier handling.
- 21. When leakage is detected (usually indicated by odor or by eye irritation), the leaking container should be removed to outside air and the contents emptied into a sound container. Personnel doing this work should wear chemical goggles and, if the leakage has been extensive, respiratory equipment. Flushing with water may not be very effective because of the insolubility of CH<sub>2</sub>Cl<sub>2</sub> in water.
- 22. Forced air should not be used to dry up spills because it will increase air contamination. Mops and rags can be used to soak up the liquid, and they should then immediately be placed in closed containers and carried out-of-doors where they can be dried safely. Auxiliary exhaust ventilation may be used to restore conditions to normal more quickly.
- 23. Storage in well-constructed tanks usually presents fewer problems than does storage in drums. If the tank is located inside, the precautions outlined for drum storage and for handling leaks apply. Pressure storage in horizontal tanks conforming to the ASME Boiler Construction Code, Section VIII, "Unfired Pressure Vessels," is recommended. The tank storage capacity should be one and one-half times the normal quantity ordered.
- 24. Outdoor storage tanks of small or moderate size should be protected from the direct rays of the sun. Larger or bulk storage tanks holding thousands of gallons are usually so designed and located as to minimize problems due to temperature rises. The storage tank should be grounded to a water line or should have its own separate ground, to discharge static electricity which builds up when liquid is being

area, and it should be well ventilated, especially at floor level. Protection from low temperatures is not normally required.

<sup>\*</sup>Underwriters' Laboratories Report on the Comparative Life, Fire, and Explosion Hazards of Common Refrigerants (Underwriters' Laboratories).

pumped. Welding must not be done on a storage tank which contains or has contained methylene chloride until the tank has been emptied and thoroughly purged with air.

# Handling

- 25. For users of small quantities of methylene chloride, dispensing from standard 55-gallon drums is both economical and easy, provided that a drum dolly and rotary hand pump are used. Transferring by hand, using open buckets, is not recommended because spillage is almost unavoidable. The most efficient method is to pump the solvent through a pipe connected directly to the small opening of the drum. Small containers used for storing or transferring methylene chloride should be of a type which can be closed.
- 26. Drums should be in good condition with tight bungs. If a single drum at a time will serve, it should be mounted vertically on a drum dolly and equipped with a rotary hand pump of a design approved for handling chlorinated solvents. Care should be taken not to overfill small containers.
- 27. The drum when not in use should be kept in a well-ventilated area away from direct sunlight or other source of heat that might build up pressure in the drum. Because of the high vapor pressure of CH<sub>2</sub>C1<sub>2</sub> at temperatures in the order of 85 F or higher, considerable gas pressure may develop in the drum. The operator should wear eye protection when removing the bung to prevent solvent or vapor from being blown into his eyes.
- 28. When more than one drum is needed, horizontal positioning on a steel frame or horizontal installation of a storage tank may be desirable. By means of suitable piping and flexible metal hose, the drums can be equipped for drawoff of small quantities or the material can be piped to machines.
- 29. When a quantity greater than that provided by two drums is required, a storage tank is preferable. With a tank, a sight glass can be used to determine the level of the solvent and the piping arrangement

- can be simple in design. Allowances should be made on normal pump specifications because the load on the motor used in pumping methylene chloride will exceed by 35 per cent the load when pumping water under similar conditions.
- 30. When methylene chloride is delivered in tank cars, certain special precautions should be taken. The car should be accurately spotted on a level track, the hand brakes should be set, and the wheels should be blocked with standard rail clamps, to prevent the car from shifting during unloading operations and causing rupture of piping or connections.
- 31. When a tank car is to be unloaded by gravity into a storage tank at a lower level, the bottom unloading valve must be closed before the bottom plug is removed. Most bottom unloading tank cars have an interior plug valve, operated from the dome, and an exterior gate valve fitted with a plugged or capped nipple. Before making connections to the bottom outlet for gravity or pump discharge, the interior plug valve should be closed from the dome.
- 32. Because pressure may be built up in transit, the air vent on the dome should be carefully opened. After pressure has been released, the bolted dome cover must be removed to permit ready flow and to prevent possible collapse of the tank. The bottom outlet valve should then be opened and the piping and connections checked for leaks before full-scale unloading proceeds.
- 33. Bottom unloading by pump may be used where storage tanks are at ground level or higher. The precautions indicated in paragraphs 31 and 32 apply.
- 34. A pump-suction siphon system may also be used. The suction line is connected to the eduction pipe located on the dome, the air vent is opened, and the dome cover is removed before siphoning is started.
- 35. The least desirable method of unloading is the use of air pressure. This method is not recommended for chlorinated solvents because trouble can develop at too many

- points. If air pressure is used, it must be limited to 23 pounds per square inch gauge.
- 36. The problems encountered in unloading with air pressure are common to all volatile solvents. There is the danger of rupturing the tank car with too much air pressure. If the air supply is not filtered, there is danger of contaminating the solvent with oil and water. There is also the danger of solvent loss from blowing air through the lines and storage tank after the car is empty.
- 37. After unloading of a tank car has been completed, all valves and outlets should be closed securely, air lines or outlet lines should be removed, caps and plugs should be replaced, and warning signs should be removed before the car is released. This phase of the operation should be completed promptly to prevent delays and possible damage if the car is removed or left open.
- 38. The procedures outlined for unloading railroad tank cars may be applied to truck deliveries, but even greater care must be used at every step because of the relatively lighter and more mobile nature of truck equipment.
- 39. In dip tank operations, the main hazards are that methylene chloride may splash into the workers' eyes and that the men may suffer narcotic effects and irritation from working too close to the material. Eye protection is needed at all time around dip tanks. Such tanks nearly always require effective exhaust ventilation applied through either a perimeter slot or a hood enclosure with one open face.
- 40. Where methylene chloride is used in small hand operations, its excellence as a degreaser causes rapid de-fatting of the skin. Gloves resistant to chlorinated solvents, eye protection, and good ventilation are essential in hand operations.

# Personal Protective Equipment

- 41. Wherever methylene chloride may splash into the eyes, chemical goggles or a suitable face shield should be worn.
  - 42. Methylene chloride solvent

may normally be handled in wellventilated spaces without respiratory protection. Serious effects, such as rapid unconsciousness, would be expected only in very small confined spaces like storage tanks or where a large spillage has occurred in a small room or area. Workers who enter such a space should wear fullface air-line respirators or self-contained breathing apparatus. Canister type gas masks, approved for chlorinated hydrocarbon solvents by the U. S. Bureau of Mines, may be used in areas where the oxygen content of the air is greater than 16 per cent by volume and where the gas concentration does not exceed 2 per cent by volume.

- 43. Respiratory protection should be used until tests have shown that the space has been cleared. Testing equipment for chlorinated hydrocarbons is commercially available.
- 44. On operations in which skin contact with methylene chloride can occur repeatedly during the working cycle, workmen should be provided with protective gloves and aprons. Gloves and aprons fabricated from or impregnated with polyvinyl alcohol, vinylidene chloride, or neoprene are resistant to methylene chloride. Rubber items tend to swell and become tacky on exposure to this solvent. Protective creams cannot be relied upon to afford adequate protection.

# **Symptoms of Poisoning**

- 45. Inhalation of methylene chloride in concentrations several times the maximum acceptable concentration results in an anesthetic or inebriating action. Methylene chloride is a narcotic, and inhalation of its vapors may produce nausea, dizziness, headaches, and general ill feeling. Chlorinated solvents, in general, are considered to be more toxic to those persons who have ingested alcohol up to 12 hours before use of these solvents. The shorter the time between alcohol intake and exposure to vapor, the more rapidly the symptoms of exposure are developed.
- 46. The vapors can usually be detected by odor at concentrations around 320 parts per million parts

of air by volume. It is possible for a person to detect concentrations as low as 25 to 50 ppm when first entering a room containing the vapors. However, odor is not a good warning because the olfactory nerve endings are soon dulled and become insensitive to the odor.

# First Aid

- 47. The first and most important step in the treatment for excessive exposure to methylene chloride vapors is to remove the individual from the exposure. Most of the symptoms will then subside. Medical attention should be obtained, however; and, after serious exposure, circulation and respiration should be watched. If breathing stops, artificial respiration should be started at once.
- 48. If methylene chloride comes in contact with the body, liquid-soaked clothing should be removed and the skin should be rinsed with water. It is usually not necessary to wash clothing after it has been contaminated with methylene chloride. The clothing should be dried thoroughly out-of-doors, so that no odor of the solvent remains. Any dermatitis should be treated by a physician.
- 49. If solvent gets into the eyes, they should be flushed with large amounts of water, preferably for about 15 minutes, and medical attention should be obtained.
- 50. If the liquid solvent is swallowed, vomiting should be induced at once by means of an emetic such as salt water (2 tablespoonfuls of salt in a glass of warm water), and a physician should be called.

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# PLANT DESIGN AND CONSTRUCTION

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MAN can never escape his environment. Wherever he is, he is always a part of it. But he can make it safe by application of intelligence and energy.

Environmental hazards can to a great extent be controlled by sound engineering design, by planning plants for the people who work in them. Buildings, work facilities, and personal service facilities should be planned around the needs, capacities, and limitations of the individual.

Industrial engineering plans the efficient use of equipment and human skills without undue hazard or strain on the worker.

Preplanning an entire plant, remodeling buildings, and revising processes all offer opportunities for establishing a safe and hygienic working environment.



# no slip...no slide...no skid ...with A.W. ALGRIP abrasive flooring

Be sure of safe footing at the hazardous places in your plant. You know where they are . . . wherever slipping, sliding and skidding occur. Now your slippery spots can be your safest spots . . . with A. W. ALGRIP flooring.

Here's a rolled steel floor plate that's made by an Alan Wood patented process in which an abrasive is embedded to a controlled depth . . . becoming an integral part of the steel plate, to give you lasting safety.

A. W. ALGRIP can be used as independent flooring... or as flooring overlay. Put your plant on a safe footing, with A. W. ALGRIP... Approved for Safety by Underwriters' Laboratories. Write for Bulletin AL-N1.



# **ALAN WOOD STEEL COMPANY**

CONSHOHOCKEN, PA.

DISTRICT OFFICES: Philadelphia • New York • Los Angeles • REPRESENTATIVES: Attanta • Boston • Buffalo Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

Circle Item No. I—Reader Service Cord

Planning a new plant?
Modernizing the old one?
Get the reactions of those who'll have to operate, supervise and maintain the facilities. That includes the safety, plant protection, and industrial hygiene staff.



# Let's Start with the Plant

THERE IS no better foundation for safe operation than pre-planning it into the plant layout. A plant expertly planned and laid out can be expected to have a minimum number of accidents, fires, and absences from occupational diseases.

It's nice, of course, to have a new plant. It offers unequalled opportunities for better ventilation, lighting, efficient materials handling, and employee services. But many of these improvements can be added to existing plants.

For new buildings and extensive modernization, it is best to call on a firm experienced in industrial construction. Its engineers are familiar with operating requirements and the various codes. However, every plant is different, and a satisfactory plant requires numerous conferences between customer and builder.

Plans should, of course, be approved by state and municipal authorities before construction starts. Changes in finished buildings are expensive.

Compliance with local regulations, however, does not necessarily guarantee safety. Some city codes are unduly restrictive, and others are lax. Here the industrial engineer can help in determining adequate standards of design and construction.

Visual aids are important in planning the plant. When people can see things, they understand them much better. Engineers can get a clear picture of the plant from blue-

prints. But many other persons who have a stake in the project can't visualize it so easily. A three-dimensional layout can produce a finished plant and its adjacent area on a table top.

The plant site. Employees must travel to and from work, and the plant location may subject them to transportation hazards. With the usually heavy influx of traffic at shift changes, there is a tendency to rush out of the plant and beat the whistle getting in. If the plant is on a busy highway, plant approaches should be carefully planned.

A plant situated on a terrace may require outside stairs or ramps. These may become hazardous in inclement weather.

One-way traffic lanes are sometimes desirable in the layout of the grounds.

Entrances and exits. The mass production potentials of modern industry require that materials and personnel be able to move in and out of the plant quickly and safely. Features to include in plans are:

Where volume of traffic is heavy, receiving and shipping departments should be designed with depressed docks or elevating platforms to permit loading and unloading by mechanical means at floor level.

Where possible, rail, highway truck, industrial truck, and pedestrian traffic should be separated. If impossible, then added precautions should be taken to prevent collisions.

Sharp turns, grades, blind spots, intersections, crossovers, and congested points are hazardous.

Entrance and exit gates should be not less than 35 ft. from property line structures that might obscure vision. Gates for vehicular traffic should permit drivers leaving the premises to have a clear view of cross traffic.

Passenger loading and unloading facilities should be arranged to avoid traffic hazards and reduce time and effort required to reach the plant. A plant on a main highway should provide space where buses can load and unload off the road.

Shelters for employees using public conveyances should be considered.

Some companies allow buses to run into the plant. They go down a ramp to a central location; employees reach their jobs through passages below the main production floor.

Where traffic is heavy, an underpass or overpass will reduce congestion, delay, and hazard.

Hazardous processes. Fire and explosion hazards demand isolation. Smoke, fumes, dust, odors, and noise are other reasons for banning an industry from some neighborhoods.

Minimum distances between buildings of various types, sizes and occupancies are specified in fire-protection codes. For flammable and

# HOW DOES YOUR PLANT RATE?

These factors are important in establishing safe, hygienic working conditions. Many of them can be improved in existing plants.

1. Site:

Topography
Drainage
Room for expansion
Zoning restrictions

- 2. Transportation facilities:
  Docks and wharves
  Railroad
  Highways and plant roadways
  Mass transportation for employees
  Parking facilities
- 3. Exits and other wall openings
- 4. Walkways: floors, stairs, ramps, platforms
- 5. Storage facilities:
  Flammable, explosive materials
  Toxic substances
  Raw materials
  - Finished products
    Yard storage
- 6. Electric wiring and installation
- 7. Illumination
- 8. Materials handling equipment:
  Cranes
  Conveyors
  Industrial trucks—power and hand
- 9. Elevators
- 10. Boilers and other pressure equipment
- 11. Ventilation, dust control, air conditioning
- 12. Fire protection
- 13. Noise and vibration control
- 14. Health and safety:

Water—drinking and sanitary uses
Waste disposal
Medical and first aid service
Personal protective equipment—
distribution and repair facilities

15. Personal service facilities:

Washrooms and lockers Food service Employment offices Training programs

explosive materials, minimum distances between storage areas and other property are specified.

Topography. In some locations floods may be a recurring threat during heavy rains or early spring thaws. Established plants may not find it possible to move to higher ground, so emergency plans for protecting life and property should be arranged on a neighborhood basis.

Where flooding is possible, multistoried buildings have advantages. Upper stories provide a place to which valuable equipment may be moved.

Climate. In colder regions, ice and snow removal are seasonal problems. Buildings must be planned to withstand roof loads. Fire protection also requires special attention.

Keeping the plant warm while removing air contaminants may make ventilation complicated and expensive. Covered storage of materials is often necessary in regions of severe cold and heavy rainfall.

In hotter areas, heat and humidity, often increased by manufacturing processes, may cause fatigue, low output, and sometimes heat exhaustion. Many industries now aircondition for comfort as well as for manufacturing processes.

Winds of high velocity are most common in warmer climates, but no area is entirely free from them. Where hurricanes or tornadoes are frequent, roof anchorage is important. Data regarding windstorms and lightning are available from insurance companies.

Waste disposal. Removal of solid and liquid wastes is a problem for many industries, often complicated by the expansion of centers of population. Some waste materials must be treated before they are discharged into streams or otherwise disposed of.

Radioactive wastes bring specialized problems. Their disposal is governed by procedures established by the U. S. Atomic Energy Commission.

Sewers should not be located where leakage might contaminate water sources. Sewerage systems should have enough manholes or other openings for maintenance.

Parking space is often a deciding factor in selecting the location of a plant or shopping center. Lots should be adequate in size for employees and visitors, with separate entrances and exits. If separated from the plant by a busy thoroughfare, an underpass or bridge may be needed.

Traffic and directional signs aid in proper use of the area.

Employee circulation. Efficient circulation of employees from parking lot through time clocks and lockers to work areas is considered in the plans.

Light and air. Modern lighting and air conditioning make man independent of nature for light and climate. Controlled conditions may be obtained in a windowless factory or one of conventional design. Windowless buildings, however, may complicate the problem of fire protection.

Movement of industry to outlying areas, where property values are lower, has encouraged the construction of one-story plants. In addition to lower costs, the advantages of one-story construction include:

- Concentration of operations under one roof.
- Freedom from stairs and elevators.
- 3. Ease in routing and handling heavy and bulky equipment.
- 4. Better lighting and ventilation.
- Easier isolation of hazardous operations.
- Efficient handling of material in process.
- 7. Ease of supervision.
- Lower operating and maintenance costs.
- Possibilities of pleasing architecture and landscaping.

-To page 51

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# **Lighting the Workplace**

For better seeing, safety and production



HIGH-BAY lighting with alternate staggered system of mercury and fluorescent lamps. Spacing 12½ x 18 ft. Mounting height 47 ft. Maintained illumination 60 fc. (General Electric Co.)

ADEQUATE non-glaring light is of first importance in any industrial establishment. The same levels of light should be maintained for day and night operation.

Even during daylight hours the sun will not furnish adequate light for all work areas in a building. Modern light sources and lighting equipment, fortunately, have made industry independent of daylight.

What is good lighting? If the eye is to function effectively, the installation must:

 Provide adequate light at the work surface. The worker must see easily and accurately without strain and undue fatigue.

2. Minimize contrast, glare and

Supply light of suitable quality for quick and accurate judging of details.

 Contribute a pleasing atmosphere to the workplace.

Light finishes, applied through the medium of paint, increase the effectiveness of any lighting system. They conserve light, soften contrasts and provide a psychological tonic.

# **Artificial Light Sources**

Industry's three major light sources are fluorescent, mercury vapor, and incandescent. In modern practice, they frequently are combined to meet special lighting situations.

Fluorescent lighting is used widely in all types of commercial and industrial operations at low and medium heights, also for high-bay mounting over large areas.

Mercury vapor lighting is largely used for medium to high-bay lighting in comparatively narrow room areas.

Incandescent lighting, with appropriate fixtures, may be used at any mounting height.

Fluorescent and incandescent lamps are used for supplementary bench and machine lighting.

Comparative efficiency. The efficiency of any light source is the ratio of light produced in lumens to power consumed in watts.

The fluorescent lamp, generally speaking, provides more than 3 times the light per watt of an incandescent lamp. It lasts approximately 7 times as long.

The mercury vapor lamp produces more than 2½ times the light per watt of an incandescent bulb and lasts more than 5 times as long.

An incandescent lamp can be used with any standard socket. Fluorescent and mercury vapor lamps need auxiliary ballast equipment. The wattage used by auxiliary equipment must be added to that consumed by the lamp to obtain the over-all wattage efficiency figure.

Fluorescent lamps excel in both efficiency and quality of light. The long, luminous tubes diffuse light over a wider area, make for more comfortable seeing and reduce glare and shadows to a minimum.

The fluorescent lamp produces three times the visible light but only half the radiant heat of the incandescent lamp. This cooler light helps reduce the cost of air conditioning.

Mercury vapor gives a high volume of concentrated light per fixture. This makes it ideal for highbay installation.

Long life is an important feature—averaging more than a year on typical two-shift operation. Mercury vapor provides a compact, controllable light source which performs well in all temperatures. It is simple to maintain and has a wide variety of applications.

The blue-white hue is adequate for the black, gray, and white seeing tasks of many industrial operations.

The basic color of the light can be modified by using color-improved mercury lamps or by combining with fluorescent or incandescent lighting.

-To page 127

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(See also Color, Section 2)

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# Floors for Heavy Duty

# How to maintain safety under foot

FLOORS in factories, warehouses, and public buildings must be of rugged construction to stand up under the wear and tear of daily use. With the right materials and proper construction their useful life can be prolonged by correct maintenance methods.

Three things are expected of a floor: it must stand up under traffic without excessive maintenance costs, it must be reasonably easy to keep clean, and it should provide a sure footing.

Adequate structural strength is the first consideration, particularly in multi-story buildings. Then the surface material must be selected for operating and traffic conditions. A wide choice of materials is available.

When installing new floors or replacing old ones, this procedure is suggested.

1. Divide the plant into areas. List type of service in each. If the floor is subjected to more than one type of use, add another classification.

Typical areas are: aisles, storage areas, work places, heavy machine areas, loading docks, assembly areas, corridors, offices, rest rooms, cafeterias, and laboratories.

2. Check service requirements. How many of these conditions apply to each area?

Size of area. What would the job cost?

Traffic. What is type and volume? Is it chiefly pedestrian or vehicle? Is resistance to slipping vital? What aisle widths and clearances will be needed?

Loads. What type of load—standing, impact, rolling, sliding, or vibrating? What will be maximum weight and concentration?

Water. Will floor be subjected to standing water, humidity, condensation, hot water, or steam?

Temperature. Will there be exposure to excessive heat or cold that might cause deterioration of some flooring materials?

Weather. Is there exposure to strong sunlight, freezing temperatures, snow, ice, or rain?

Fire and explosion hazards. Are there flammable dusts or vapors that could be ignited by a spark? Is an electrically-conductive, non-sparking floor indicated?

Chemicals. Will there be spills of solvents, acids, alkalis, or grease?

Product cleanliness. Do food processing or precision machining operations demand floors that can be sanitized?

Appearance. Is it a primary consideration?

Maintenance. Will the area demand vigorous cleaning?

3. Write for information. Much research on flooring materials, installation, and maintenance has been conducted by government agencies, trade associations, manufacturers and independent laboratories. Among sources of information are:

National Bureau of Standards.

Floor associations—Asphalt Institute, Asphalt Tile Institute, Maple Flooring Manufacturers Assn., Oxychloride Cement Assn., Portland Cement Assn., and Tile Manufacturers Assn.

Manufacturers' catalogs.

Floor experts, architects, or engineers.

# **Flooring Materials**

Each material has its limitations. Some with good durability and resistance to slipping may be too expensive for general use. These are often usable for limited special

# COMMON FLOORING MATERIALS FOR INDUSTRIAL USES

AREA	Concrete	Asphalt hot mastic	Asphalt	Wood block	Wood plank	Asphalt tile*	Greaseproof asphalt tile	Resin binder mastic	Linoleum*	Terrazzo	Rubber tile*	Ceramic tile*	Vinyl tile*	Metal plates	Grating
Floors on grade	x		×	×	×	×							ж		
Floors below grade	x		×			×	x								
Suspended floors			x		×	×	ж	x	×	×	x	x			×
Driveways	×	×	x												
Ramps and loading docks	×		×	×											
Manufacturing areas			x	×				×							
Warehouses			x	x											
Stair treads	x					×			×	×			x	×	х
Offices						×			×		×		x		
Laboratories						×	×		×	x	x		x		
Cafeterias							×		×				x		
Washrooms	x					×				×	×	×	x		
Food processing	×						×					x			
Corridors									×	×			x		
Platforms, catwalks					x									×	×

<sup>\*</sup>Also available in electrically conductive grades for explosion-hazardous areas

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areas where a sure footing or resistance to chemical or abrasive action is important.

Smooth, hard surfaces such as concrete are susceptible to chipping and abrasion. Heavy falling objects and trucks with steel wheels chip away at the surface. Rubber tires are easier on floors as well as on ears.

Concrete is suitable for a wide variety of interior and exterior uses. It is excellent for damp locations, but does not withstand acids. The floor should be graded for drainage.

Drains with strainers are needed where the surface is cleaned by flushing or where there is possibility of flooding.

A durable roughened surface, resistant to cracking and dusting, can be obtained by a wood float finish to a mixture of pea gravel, sand, and cement, Too smooth a surface is slippery when wet and is actually more tiring to the feet than a rougher one.

Hardening compounds or sealers prevent dusting.

Pre-cast concrete floor slabs are often used for large areas, where the cost is said to be lower than for poured concrete. A granolithic or other finish may be laid over the slabs.

Concrete floors can be made conductive and non-sparking with surfacing compounds containing nonferrous metallic aggregate. This treatment also makes the floor more wear resistant.

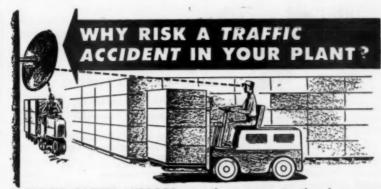
For repairing holes and cracks some compounds are superior to concrete. Patching with concrete, even when well done, may crack under heavy loads.

For painting, a general purpose floor enamel may be used but finishes prepared especially for concrete are more durable. New concrete should be treated with zinc sulphate solution to neutralize alkalinity.

Concrete provides a rigid and substantial base for resilient types of flooring.

Resilient non-slip mats are an aid to comfort where employees must stand in one position for long periods. Those who move about in their work are less likely to complain about floors being cold or hard. Footwear also has a bearing on comfort.





KLEAR-VU SAFETY MIRRORS are the answer to the dangerous blind corner problem in your plant or warehouse. They are also adaptable for outdoor use in your parking lot, loading dock area or other points where traffic converges.

Mounted at cross aisle intersections, entrances and exits at a height of 8 to 10 feet, Klear-Vu Safety Mirrors clearly reflect oncoming intersection traffic to

oncoming intersection traffic to both power truck operators and pedestrians.

Available in either convex or flat glass styles, the mirrors are easily installed and quickly adjustable to any desired angle.

M.R. Indicates metal rim

Special sizes made to order, Polished flat metal mirrors available.

LESTER L. BROSSARD CO.

Write for Bulletin. Circle Item No. 4-Reader Service Card



Safety first with

# **FERROX®**

# costs a lot less

Why keep paying for slipping accidents? Simply install low cost, long lasting Ferrox. It provides non-slip footing on all surfaces, wet or dry. One gallon covers approximately 35 to 40 square feet. • Write for Ferrox bulletin.

# AMERICAN ABRASIVE METALS COMPANY

464 COIT STREET, IRVINGTON 11, NEW JERSEY



Maximum guard rail safety...

Minimum construction cost

# with SPEED-RAIL SLIP-ON FITTINGS

no clamps, no washers,
no nuts to assemble

It's been proved many times that safety guard rails and balustrades built with Speed-Rail structural pipe fittings will save construction time and money. These unique fittings are simply slipped onto standard I.P.S. pipe and the set screws tightened with a hex wrench. Costly threading and welding are eliminated, pipe-cutting is reduced to a minimum.

SPEED-RAIL Fittings, and the heavier-duty NU-RAIL Fittings, are the <u>original slip-on</u> structural pipe fittings. They are also the <u>simplest</u> and <u>strongest</u> fittings for building pipe structures.

Be sure you have full information on the only truly complete line of structural pipe fittings—SPEED-RAIL and NU-RAIL Fittings. Leading distributors stock them; get all the facts now—write Dept. 18-S.

THE HOLLAENDER MANUFACTURING CO., 3841 Spring Grove Ave., Cincinnati 23, Ohio



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Asphalt (hot mastic) is non-dusting, elastic, odorless, and easily repaired. Problems of application restrict its use indoors.

Asphalt is resistant to weather and moisture but is affected by oils, solvents, acids, and alkalis. It stands up well under traffic but ordinary grades soften at temperatures above 95 F.

Harder grades of asphalt remain firm up to 158 F. There are also acid-resisting grades.

Asphalt emulsion (cold mix), sold under various trade names, is made into a mortar with sand and cement, and laid about ½-in. thick. It is used extensively for patching. On a substantial wood base it will carry moderate traffic; with a concrete

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# Stairs, Ramps, Fixed Ladders

WHERE operations are conducted on more than one level, permanent access structures are needed. These may be stairs, ramps, or fixed ladders.

The choice is determined by local conditions, including space available and nature of traffic.

Stairs are used where the grade is between 20 and 50 degrees from the horizontal.

Ramps are used where space permits and where there is considerable



STAIRWAY, platforms, and hoist used in refueling reactor in experimental laboratory. Note standard railings, toeboards, slip-resistant treads. (Babcock & Wilcox Co.)

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# GETS-A-LITE GUARD and GUIDE

Quickly and Easily Installed by Anyone-No **Tools Needed!** 

- Simply slip GETS-A-LITE GUARD AND GUIDE over the fixture, as illustrated. Made of indestructible spring steel wire. Nothing to break, get out of order or replace. Will last indefi-nitely. nitely.
- Once installed, GETS-A-LITE GUARD AND GUIDE is NEVER removed.
- Nothing to unlock, fuss with or lock, when changing lamps.

  GETS-A-LITE GUARD AND GUIDE actually steers lamp into socket, enabling maintenance man to change lamp in 10 seconds!
- Available for 40 watt and 100 watt fluorescent lamps.

GETS-A-LITE CO .- Dept. NSN-39

3865 N. Milwaukee Ave., Chicago 41, III.

wheeled traffic. They should slope as little as possible; 15 degrees should be the maximum.

Fixed ladders are for grades over 50 degrees. They should be installed only where there is not enough space for stairs or ramps.

# Stairs

Avoid long stair flights. Landings every tenth or twelfth tread are recommended.

For grades between 7 and 20 degrees, a combination of stairs and level landings may be used.

Provide adequate light for stairways, Replace burned-out lamps promptly.

Treads and risers. Ratio between depth of stair treads and height of risers determines the angle or pitch of the stairs, which should be between 30 and 35 degrees from the horizontal.

Tread width and riser height must be constant for each flight.

Winders should be avoided if possible. Wedge-shaped treads make it more difficult to ascend or descend safely.

Treads must be wide enough that, in descending the stairs, the ball of the foot does not project beyond the nosing and the heel does not strike against the riser above.

Building Exits Code, A9.1, specifies that treads of new stairs shall not be less than 91/2 in. exclusive of nosing; also that no tread of less than 6 in., exclusive of nosing, shall be permitted.

Stairs subjected to severe use should have treads with a durable non-slip surface. Materials used for original installation or repairs include:

Concrete Abrasive metal Steel with extruded patterns Grating Plastic compounds Rubber and fabric with abrasive surface.

Risers should not be more than 8 in. nor less than 5 in. in height. Greater or less height will cause an unnatural stride which may result in a serious fall.

Railings and handrails. ASA Code Floor and Wall Openings, Railings and Toe Boards, A-12, requires that

# Don't take chances



# Learn how easily you can prevent costly slippage

Flintdek is a trowel-applied synthetic plastic for surfacing floors, decks, ramps, ladder treads, steps and other walking areas that are hazardous for foot traffic.

Covers 50 sq. ft. per gallon. Mineral fillers assure tractive resistance against slipperiness under dry, wet or oily conditions.

Flintdek in all normal usage is applied over concrete, steel, plastics or aluminum and resists oil, water, gasoline, alcohol and dilute acids.

Ask for complete information and sample in color.

\*Reg. U.S. Pat. Off.

THE FLINTKOTE COMPANY Industrial Division

30 Rockefeller Plaza, New York 20, N.Y.



Manufacturers of the Broadest Line of Building Products in America Circle Item No. 8-Reader Service Card

every flight of stairs having 4 or more risers shall be equipped with standard stair railings or standard handrail as specified.

Spiral stairways are installed where there is not enough space for conventional stairways. Either type can be installed by plant personnel from standardized parts obtainable with a variety of slip-resistant treads.

# Ramps

Ramps facilitate wheeled traffic between levels. For foot traffic they are preferable to stairways when practicable. They should be built to the least slope possible. Maximum recommended slope is 15 degrees. A rise of more than 1 ft. in 10 is prohibited in some states.

For wood ramps materials used in construction should meet the requirements for scaffolds. Width should be adequate for traffic and open sides should be protected with standard railings 42 in. high.

Toe boards should be installed where the ramp extends over a work place or passageway. Cleats 16 in.

apart are needed on steep inclines.

Planks should not overlap. The length of the plank should run the long way of the ramp. Ramps used for wheelbarrows should have an odd number of planks with no cleats on the center plank. Width should not be less than 3 ft.

Concrete is recommended for heavy traffic. Anti-slip surface is obtained by rough floating or incorporated in the finish coat. Hardeners and troweling should be avoided.

Concrete that has worn smooth can be roughened by scrubbing with dilute nitric or muriatic acid. The surface is then hosed to remove all traces of acid.

Ramps used by heavy vehicles, such as power trucks and heavyduty hand trucks, should have solid curbs as well as handrails.

Ramps included as part of aisles or traffic routes should be as wide as the aisle to avoid bottlenecks.

Splinters, nails, irregularities and breaks in the surface should be repaired immediately. Cracked or pitted concrete can be resurfaced with one of the numerous flooring compounds on the market.

Snow removal. Outdoor ramps and platforms should be kept clear of snow and ice in winter. If ice cannot be removed immediately, sand or cinders may be applied to give traction. In cold climates radiant heating installed in the concrete is often a good investment.

# Fixed Ladders

Fixed ladders should have parallel sides of wood or metal, and should be permanently fastened at top, bottom, and intermediate locations. If 20 ft. or longer, the ladder should be provided with cage or basket guard.

Fixed ladders over 30 ft. long should be built in zigzag sections, unless cages are used, and should be provided with platforms at intervals of not more than 20 ft.

Side rails should be carried 31/2 ft. higher and preferably goosenecked. Openings more than 18 in. between the ladder and the working platform should be protected by a landing platform. \*\*\*



# Seat More People in Less Space!



"Lifetime" Cast Construction

# SECTIONAL TABLES

For Industrial Dining Rooms, Schools, Hospitals, Institutions

Seats swing out of the way, save space...save maintenance .. eliminate confusion of loose chairs. Rugged cast construction for lifetime service. New colorful tops in Formica, Stainless Steel, Cafolite, or Edge Grain Maple cast iron bases in choice of colors. Seat 4 to 24 people



THE CHICAGO HARDWARE FOUNDRY CO. 1039 Commonwealth Ave. North Chicago, III.

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# HOUSEKEEPING AND MAINTENANCE

# IN SECTION 2

Housekeeping and Sanitation 27

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HOUSEKEEPING in industry covers a wide range of maintenance and sanitation activities which pay off in the conservation of life, health, and property. It controls many of the causes of accidents, fires, wasted time, spoiled materials, and occupational diseases.

Good maintenance is indicated by clearly marked and uncluttered aisles, floors free from litter and oil splashes, orderly storage, freshly painted surfaces, and equipment kept clean and in efficient operating condition.

Attaining these objectives requires organization, training, and supervision, also equipment and supplies. Back of an effective program there must be a realization by management that maintenance is not an unproductive side line.

While the maintenance force is protecting the plant and its personnel, its members also need protection. Their work often takes them to out-of-the-way places, requiring safe ladders and scaffolds and many of the items of personal protection described in Sections 5 and 6.

Keep your floor-maintenance men happy...



# with Job-Fitted EQUIPMENT!

Choose from the COMPLETE Final Line

More than a score of models and sizes

More than a score of the equipment permits selection of the equipment that's exactly right for your job!

However much a maintenance man may want to do a good job, and at the same time show savings in labor costs, he's stymied if the machine is too small, or too large, or is otherwise unsuited to the job. Different floors and areas call for different care and equipment. That's why Finnell makes more than a score of floor-maintenance machines. From this complete line, it is possible to choose equipment that is correct in size as well as model . . . that provides the maximum brush coverage consistent with the area and arrangement of the floors.

Finnell offers Conventional Polishing-Scrubbing Machines in both concentrated and divided-weight types, each in a full range of sizes ... a Dry-Scrubber, with self-sharpening brushes, for cleaning grease-caked floors ... Combination Scrubber-Vac Machines for small, vast, and intermediate operations, including self-powered as well as electric models ... Mop Trucks ... a Wet and Dry Vacuum Cleaner, in baked enamel or stainless steel, with 1½ hp By-Pass Motor. In addition, Finnell offers a full line of fast-acting Cleansers for machine-scrubbing ... Sealers and Waxes of every requisite type ... Steel-Wool Pads and other accessories — everything for floor care!

In keeping with the Finnell policy of rendering an individualized service, Finnell maintains a nation-wide staff of floor specialists and engineers. There's a Finnell man near you to help solve your particular floor-maintenance problems... to train your operators in the proper use of Finnell Job-Fitted Equipment and Supplies... and to make periodic check-ups. For consultation, demonstration, or literature, phone or write nearest Finnell Branch or Finnell System, Inc., 2203 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC

Originators of Power Scrubbing and Polishing Machines



BRANCHES IN ALL PRINCIPAL CITIES

# Housekeeping and Sanitation

For safe and hygienic working conditions

HOUSEKEEPING and its twin, sanitation, involve every phase of industrial operation. Their activities cover the entire premises—indoors and out. The benefits extend throughout the community.

Housekeeping is the combined responsibility of management, supervision, and employees. Maintaining interest requires constant effort through supervision and visual aids.

To maintain the industrial environment for maximum support to production and to employee health, safety and comfort, the following tasks are involved: \*

- 1. Structural cleaning.
- 2. Floor maintenance.
- Maintenance of personal service facilities—washrooms, lockers, lounges, food service.
- Machine and equipment cleaning, both in place and in special stations and facilities.
- 5. Insect and rodent control.
- Collection and disposal of refuse and product wastes.
- Operation of laundry and uniform services, also sanitation stockroom and supplies.

- Protection of raw materials and finished products against damage and deterioration.
- Supervision of plant security personnel.
- Care of exterior a: eas—parking lots, roadways, walks, landscaping.
- Maintenance of safe working conditions.
- Maintenance of individual hygiene facilities.
- 13. Over-all sanitary supervision.

# **Plant Design and Layout**

Good design and construction mean that a plant can be kept clean, orderly and free from hazard with much less time, effort, and expense. These are characteristics of the modern plant:

- Aisles: Wide enough for movement of traffic, with floor lines marking off work stations and storage areas.
- 2. Space: Sufficient room for the individual to work.
- 3. Storage: Adequate and convenient for materials and tools.
- Materials handling: Layout planned for material flow; efficient equipment and methods.
- Ventilation: Good general ventilation, plus local exhaust ventilation to remove air contaminants at source.
- 6. Floors and walls: Of construction and materials easy to keep clean.
- Lighting: Ample, well-distributed artificial light; effective use of available daylight.
- 8. Personal service facilities: Up-todate, well-ventilated washrooms with off-the-floor fixtures for easy cleaning. Locker rooms with ventilated, sloped-top clothing cabinets built flush on concrete bases for easy maintenance; clean, light, airy, and inviting in-feeding facilities, with well-designed food-handling and serving equipment of sanitary polished metal and plastic.
- Waste removal: Adequate facilities to prevent congestion and disorder.

# Organization

Back of every effective maintenance program is an enlightened management. Carrying out the program requires a well-supervised crew of able-bodied intelligent employees, well-trained in their duties and provided with modern cleaning equipment and proper supplies.

A manual of standard procedures is helpful in training and supervising the maintenance force. The manual may consist of a few type-written sheets or a sizable volume, depending on the size of the plant and the complexity of maintenance problems.

Women are often employed for lighter duties, such as office cleaning and routine care of women's wash-

# **Cleaning Equipment**

Vacuum cleaners. Heavy-duty types are available in several models and capacities, with a variety of attachments. They are useful for removing dust from corners and overhead places, as well as for floor cleaning.

Central vacuum systems are often



CEILING-MOUNTED partitions facilitate washroom maintenance. Rubber gloves and overshoes protect against detergent solutions. (Port of New York Authority.)

°From Building and Equipment Sanitation Maintenance, by J. Lloyd Barron and Albert J. Burner. Published by Association of American Soap and Glycerine Producers, 242 Madison Ave., New York.



National Safety News, March, 1959

used where dust sources are close together and a large volume of dust must be removed. Cleaning implements are attached to inlets located at convenient intervals. Central systems are used to advantage for the removal of grain dust in buildings housing milling equipment, and in some hotels and office buildings.

For most industrial uses, portable cleaners are satisfactory, since dust sources are usually widely distributed. Portable cleaners are also used for wet pick-up-scrubbing solutions, spillage, etc.

Floor machines of several types handle heavy jobs of floor cleaning efficiently. With them, floors can be scrubbed, dry-cleaned, waxed, or polished. Attachments of various types increase the usefulness of floor machines.

Crusts of dirt, oil, and metal cuttings can be removed with revolving wire brushes much more quickly and thoroughly than by hand spudding.

For finer finishing, steel wool rolls can be used. A vacuum pickup for collecting dust is essential for dry operations. Suction in connection with a scrubber damp-dries the floor quickly. Scrubbing, rinsing and drying can be done with a minimum of interruption to production.



FLOOR MACHINES of many types and sizes remove the most stubborn dirt quickly. large self-propelled model cleaner, scrubs, rinses, and damp dries in one operation. (Finnell System.)



HEAVY-DUTY vacuum cleaner removes stray nuts, bolts, and rivets as well as dust from fuselages and wing sections during construction. Stray metal might work its way into air ducts damaging turbine blades in

Floor machines may be purchased or rented. Some manufacturers have service men who will train maintenance crews in cleaning methods.

Hand cleaning tools. Brooms, brushes, mops, etc., are still needed to supplement mechanized cleaning equipment. Tools of good quality are more durable and encourage better work. For dry sweeping, treated sweeping cloths or treated cotton yarn mops are preferable to bristle or fiber push brooms which have a tendency to raise dust. Most large organizations patronize industrial laundries which furnish cleaned and treated floor mops and sweeping cloths.

Magnetic sweepers pick up iron and steel chips, filings, nails and tacks from floors, driveways and walks, where such material may cause fire, explosion, or personal injury. This type of sweeper has a rotary non-electric magnet, detached from the unit for removal of accumulated metal.

Larger power-driven models are used outdoors for sweeping large areas. These remove nuts, bolts, and other ferrous objects around hangars and roadways where they might be sucked into jet engines.

Aisle marking. Wide, clear aisles indicate a well-kept plant. White lines are constant reminders to keep them free from obstruction and to pile stock within designated areas. Lines can be renewed quickly and economically with an aisle-marking machine.

Plastic tape in white and colors is also used for marking aisles and storage areas. It is resistant to moisture and most chemicals. Lines can be changed and damaged parts replaced easily.

White is standard for highway traffic lines and is preferred for interior floor marking.

Trash containers at convenient locations help to keep litter off the floor. Containers with self-closing -To page 48

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PAINT has been used effectively for conserving light in this explosion-proofed bay where lacquers and solvents are packed. Sliding panel-louvered walls at rear provide ventilation. Vaporproof light fixtures have been installed and floors are sparkproofed. (Sherwin-Williams Cc.)

# What Color Can Do

Conserve light—improve visibility
Create cheerful surroundings—restful or stimulating
Make a room seem cooler or warmer, larger or smaller
Encourage better housekeeping
Identify fire and accident prevention equipment
Spotlight point-of-operation on machines
Add punch to instruction and warning signs

COLOR has many functional as well as decorative uses and its applications in industry are steadily growing. But it must be applied according to established scientific principles. Otherwise there will be a riot of distracting hues. Paint manufacturers and color experts

PAINT REFLECTION VALUES

(Per cent)	. 88
lvory	. 69
Cream	67
Sky blue	. 65
Pale green	59
Buff	52
Aluminum	41

These values are only approximate since colors vary with different paint manufacturers.

have conducted considerable research on the subject and help is readily available.

Psychological effects. Certain colors have been found to produce definite mental and emotional responses. Familiar colors and the reactions they arouse are:

Yellow—cheering and stimulating.

Blue—gives a feeling of coolness; helpful where temperatures are uncomfortably high.

Green—restful to the eyes. Bluegreen is cool; yellow-green is warmer.

Red—danger, excitement; traditionally associated with fire.

Orange—bright and warm; use with caution.

# **Background Colors**

The old plan of white for ceilings and upper walls with "practical" dark colors for dadoes and machines is being replaced by color schemes which provide more cheerful and attractive interiors. Paint companies and color consultants will be glad to furnish advice.

Sharp contrasts between bright and dark areas should be avoided. They require continual adjustment of the eyes in looking from one to the other, causing eyestrain and fatigue.

White is favored for ceilings; it reflects more light—80-88 per cent. But for rooms with low ceilings, or where people may look up at them, as in hospital rooms, cream, ivory, or sky blue is preferable to solid white.

For overhead networks of girders, pipes, and other equipment, colors of high reflectance also are desirable.

For sections of walls within the range of vision, soft tints, such as light gray, green, or blue, are suitable. Soft gray, for example, is restful and does not show dust readily.

A dado the height of work benches and machines—about one third the height of the wall—makes soil and marks less conspicuous. It may be a deeper tone of the color of the upper wall but should not be too dark.

Floors should have a reflectance value of at least 25 per cent. For —To page 32

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Section 2-Housekeeping and Maintenance

# ZORB-ALL



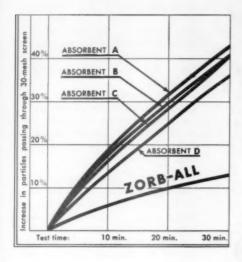
▲ ABOVE: Wyandotte Zorb-all holds up underfoot — will not powder, cake, or disintegrate.

BELOW: Ordinary floor absorbents crush to a powdered dust or "mud" underfoot.



# won't break down!

# The true test of safety in a floor absorbent



Abrasion-crush test results show rate of breakdown for Zorb-all and four other leading floor absorbents; give conclusive proof of Zorb-all's superior performance. It's been proved time and again in laboratory tests, in skid tests with rolling equipment, and in actual use! Wyandotte Zorb-all stands up best under severe punishment... assures nonskid stops when competitive absorbents fail . . . and remains effective more than twice as long as ordinary floor absorbents.

The graph at the left shows why: Zorb-all's rugged, angular particles have unequalled resistance to breakdown! As a result, Zorb-all offers maximum skid resistance, and keeps slippery surfaces safe much longer.

What's more, ZORB-ALL stays put . . . doesn't SHIFT, SCATTER, TRACK, or BLOW . . . and holds up under heavy traffic or extremely wet conditions without mudding, caking, or dusting — so sweep-up is easy. Saves you time and money!

Also important: ZORB-ALL is nonflammable, even when saturated with oil. It's the safest, lowest use-cost floor absorbent on the market today. Use it wherever slipperiness endangers workers or vehicles. Talk today to your Wyandotte jobber or representative about ZORB-ALL. Wyandotte Chemicals Corporation, Wyandotte, Mich. Also Los Nietos, Calif. Offices in principal cities.

ZORB-ALL is best . . . costs less by all tests!



J. B. FORD DIVISION

Circle Item No. 12-Reader Service Card

# Color

-From page 29

machines, benches, and desks, 25 to 40 per cent is suggested.

# **Point of Operation**

To make it easier to see work and avoid injury, spotlight the point of operation with paint. Paint the body of the machine one color and working areas another.

Four standard shades of "machine gray" are available. Critical parts can stand out in cream, light tan, or other light contrasting color.

Light source and color. Type of light should be considered in planning the color scheme. Incandescent lamps reduce strength and intensity of color because the light has a slight yellowing effect.

Fluorescent lamps are offered in several types. The four most common are: standard warm white, standard cool white, de luxe warm type, and de luxe cool type. Cool white units give a bluish hue and can be used with blue, green, and blue-violet. Warm white is suitable for ivory, cream, beige, rose, and

The de luxe lamps are used in plants where color discrimination is exacting, as for inspection, and in lounges, cafeterias, and display rooms.

# Color for Identification

Safety codes for the use of standard colors for identification of equipment and hazards have been developed by the American Standards Association. Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment Z53.1-1953 specifies uniform colors for marking physical hazards, for indicating the location of safety equipment and for identifying fire and other protective equipment.

Some chemical and petroleum companies have introduced minor variations from the ASA code, particularly where specific problems have been created by special products.

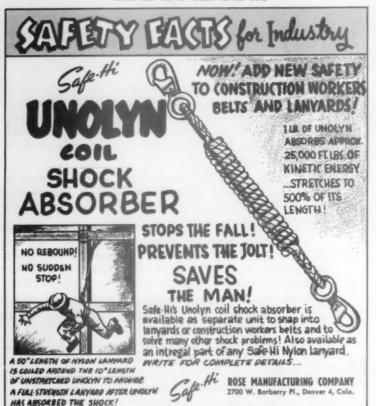
Red is for identification of fireprotection apparatus, and for walls or supports on which extinguishers are mounted; flammable liquid containers (except shipping containers) on which the name of the contents should be stenciled; lights at barricades and danger signs; emergency stops on machines such as rubber mills, wire blocks and flat work ironers, and emergency stop buttons for electrical switches.

Yellow has high visibility, suitable for marking hazards that may result in slipping, falling, and bumping into objects. Stripes or checks of yellow and black may be used to attract special attention. Top and bottom treads of stairways, low beams and pipes, and crane hooks are places where yellow may be used.

Black and yellow stripes often are used on mobile equipment, such as tractors and industrial locomo-

Green in combination with white, such as a green cross on a white -To page 35

Circle Item No. 13-Reader Service Card





# "PROTECT YOUR CLIMBERS"

With Johnson All Rubber Ankle Action Dielectric Ladder Shoes. The Choice of Ladder Climbers in all parts of the world.

WORK SAFELY ALL-WAYS

FOR EXTENSION LADDERS

Our Step Ladder Shoes are popular with maintenance men in homes, office buildings, schools, hospitals and etc.

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FOR STEP LADDERS

Johnson Ladder Shoe Inc.

Eau Claire, Wisconsin

Circle Item No. 14-Reader Service Card



Pittsburgh
COLOR DYNAMICS'
used in Chrysler
Corporation's huge
new stamping plant

Modern system of painting helps to improve productive efficiency, morale and safety of workers in world's largest factory building located at Twinsburg, Ohio.

As enother important step in the continuing expansion of its production facilities, Chrysler Corporation has activated its mammoth new stamping plant at Twinsburg, Ohio.

• Walls, cellings, floors, machines, conveyors, motorized equipment and overhead cranes throughout this immense structure are painted according to Pittsburgh's modern system of COLOR DYNAMICS.

• This huge building, covering 1,835,900 square feet of space, is the world's largest plant under one roof. Here are produced roof and rear quarter panels, fenders, door panels, deck lids and other smaller body parts for all Chrysler Corporation cars and trucks. Production capacity is 2,000 tons of steel per day.

• One of the impressive features of this new plant is the greater use of modern machinery. As this equipment reduces physical fatigue by increasing efficiency in the handling of materials, so the functional use of color, according to Color Dynamics' principles, lessens eye fatigue and nervous tension among workers.

• Proper use of eye-rest and focal colors provides better contrast be-

tween working parts and materials being fabricated. Operators see their jobs better and with less eye strain. Morale-building colors on walls and ceiling reduce glare from light sources and eliminate heavy shadows, creating more pleasing work areas. Warning and safety colors on machine controls, conveyors, motorized equipment, traffic lanes and cranes indicate hazard areas and reduce the danger of time-loss accidents.

• Chrysler's new Ohle stemping plant is only one of thousands of factories in which COLOR DYNAMICS has helped to improve productive efficiency, morale and safety. Why not test the practical value of this modern painting system in your plant? You'll find it costs no more than conventional maintenance painting.

# You can get a COLOR DYNAMICS Plan of Your Factory—FREE!

e For a complete explanation of COLOR DYNAMICS, send for our new profusely illustrated book. It explains simply and clearly what this new kind of painting system is and how to put it to work in your plant on machines, walls, floors, ceilings and mobile equipment. Better still, we'll gladly show you exactly how to apply it in your plant. Let us submit a detailed color study of your entire factory, or any part of it, without cost or obligation. Call your nearest Pittsburgh Plate Glass Company, or mail this coupon.

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# 

# We learned a lesson from a lineman





"Safety is where I shine," one of our linemen told us recently. "Safety's one of the most important parts of my job. But saving—and that's important, too, for a family man—that's too tough. Why don't you guys in the office make it easy for us—like that Payroll Savings Plan for U.S. Savings Bonds?"

Of course, that is *exactly* what we want to do for *every one* of our people. We explained that to our lineman. But he certainly made us stop and think. Because if *he* didn't know about our plan for buying U.S. Savings Bonds through Payroll Savings, then many other employees must be in the same position.

We telephoned our State Savings Bond Director for help. He worked out a company-wide campaign for us. Application cards were placed in the hands of every person on our payroll. We had a *fair* participation when the campaign started. But within days afterward, we had an *excellent* percentage of bond buying employees.

It shows that practical people welcome a chance to set up this sound savings plan. Today, particularly, there are more payroll savers than ever before in peacetime. Look up *your* State Director in the phone book or write: Savings Bonds Division, U.S. Treasury Dept., Washington, D. C.



NATIONAL SAFETY COUNCIL



#### Color

-From page 32

background, designates location of first-aid and safety equipment. Location of stretchers, gas masks, and bulletin boards is identified by this color.

Black and white, in stripes or checks, are used for housekeeping and traffic markings.

Orange has high attention value. It is the basic color for marking dangerous parts of machines or energized equipment. It emphasizes such hazards when enclosure doors are open, or when gear, belt, or other guards around moving equipment are open or removed, exposing unguarded hazards.

Blue is for warnings, such as painted barriers or flags. These should be located conspicuously at the starting point or power source of machinery.

Purple is the official color for designating radiation hazards. Yellow should be used with purple for tags, labels, signs, and floor markers.

#### **Identification of Piping**

Five basic colors for identification of the contents of pipes are specified in ASA Code, Scheme for Identification of Piping Systems, A13.1-1956. Identification may be provided by stenciled legends, decalcomanias, self-adhesive tape, or painted stripes.

Basic identifying colors are:

- F. Fire protection-red.
- D. Dangerous materials yellow or orange.
- Safe materials-green or achromatic colors (white, black, gray, aluminum).
- P. Protective materials-bright

Color may be applied the entire length of the pipe or in bands 8-10 in. wide near valves and pumps, and at intervals along the line. The name of the specific material is stenciled in black conspicuously at valves, pumps, and similar places.

Color stripes painted at the edges of the color bands also may be used to identify the exact contents of lines, but this is less satisfactory than stenciled identifications. Labels

which conform in color and size of letter to the code, are on the market.

#### **Industrial Finishes**

Paints, enamels, and lacquers provide a practical and flexible medium for the application of color. Industrial finishes often are subject to severe exposures; many types of paint have been developed for special needs.

Floor coatings. Synthetic enamels and rubber base floor coatings give better service on concrete than ordinary floor enamels and are more resistant to moisture, acids, and al-

Light-colored floors conserve light. They may be stippled with darker colors to avoid glaring contrasts.

A painted concrete floor often seems more resilient underfoot than bare concrete. The thin film of paint may help physically but the psychological effect is probably more important.

#### **Luminescent Materials**

Some types of paint, tape, and plastics become luminous in complete darkness after exposure to natural or artificial light.

Fluorescent materials glow only while exposed to ultraviolet light. There is no usable afterglow. They are used where desirable for the eves to adapt to darkness, as in instrument dials, night flying and driving, and where electric power is available for producing light. They enable the operator to observe readings without glare or eye fatigue.

Phosphorescent materials glow after exposure to light and remain luminous after the light is extinguished. They are observed best under total or near-total darkness. The glow is of low intensity, suitable only for close viewing in darkness.

Reflecting coatings or buttons are effective for direction or warning where light from headlights, flashlights, cap lamps, and similar sources is available.

Rust prevention. Paints which form a tight bond with clean metal offer protection against rust and corrosion. Where rust has started, ordinary paint is ineffective because corrosion continues under the paint film. Rust-sealing coatings, both clear and pigmented, often are helpful. \* \*

#### Here's where your Floor Maintenance Dollars Go:



A dollar or two saved by buying inferior polishes might put a smile on the Purchasing Agent's face. But, Mister, that's chicken feed compared to the real money LEGGE saves you on upkeep.

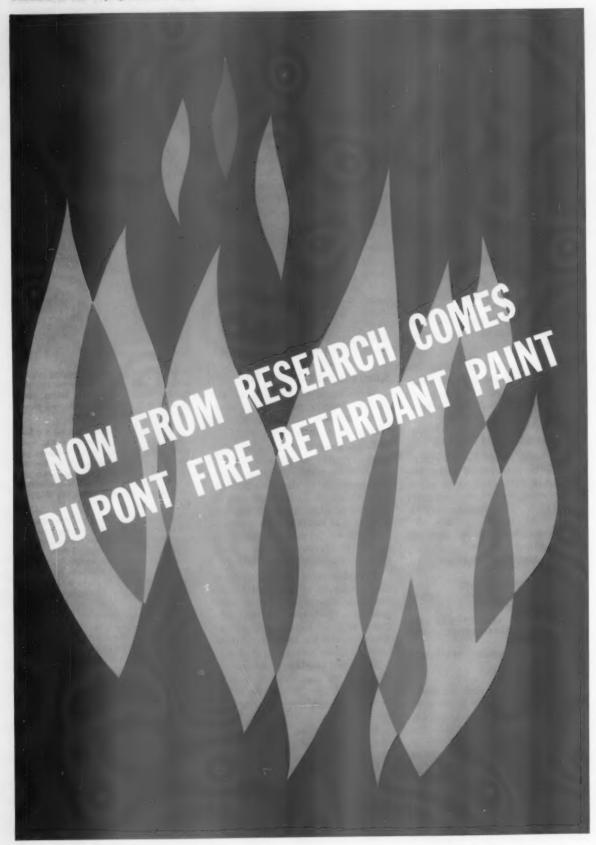
LEGGE Safety Polishes stay on the floor where they belong. Heavy traffic won't walk 'em off. They outlast ordinary polishes by up to 8 times. After the first application, a light daily touch-up program replaces the labor-consuming routine of stripping, polishing, stripping,

Materials actually cost you less because you use less. But the big payoff is: you save up to 40% on maintenance. A famous institution lopped \$19,000 off its annual floor upkeep budget. These are not just claims. These are facts which we'll be delighted to prove whenever you say the word.

May we arrange an appointment for you with a LEGGE Floor Specialist? No obligation, Or clip the coupon today for our Free booklet, "Mr. Higby and the Gremlin".



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## Proved by Underwriters' Laboratories tests to definitely retard the spread of flame.

#### Looks, applies, wears like regular flat!



Firemen have pleaded for years to "Find a way to give us a 5-minute jump on most fires and we can control them." Now Du Pont Research has helped supply the answer—Du Pont Fire Retardant Paint.

Exhaustive tests conducted by Underwriters' Laboratories have proved conclusively that Du Pont Fire Retardant Paint definitely retards the spread of flame. Yet this durable, washable interior flat finish looks, applies and wears like regular paint.

Du Pont Fire Retardant Paint can be brushed, sprayed or rolled on. And it is available in seven eyepleasing colors: Pale Blue, Sunlight Yellow, Pale Pink, Daylight Green, Light Green, Guards Gray, Ivory—and White.

Send today for FREE color folder that tells the full story of Du Pont Fire Retardant Paint. It may well be the "ounce of prevention" that can help prevent a disastrous and tragic fire loss. Just clip and mail the coupon below.

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Rush! Please send me a	FREE copy of your Fire Retardant Paint folder.
Name	Company
Name	

#### Selection, Use and Care of

#### **Portable Ladders**

EVERYBODY in industry uses ladders—either occasionally or routinely. Considering the number of trips up and down each day, the record is extremely good. Few of the accidents that do occur result from inherent defects in the material or construction. Too often the ladder has suffered abuse, or the user has neglected well-known work practices.

Accidents with even sound equipment may result when the ladder is not placed at the correct angle with the vertical surface or is not planted securely on the ground or floor. Physical defects of the user are another source of injuries.

Portable ladders, it should be remembered, are for occasional jobs at scattered points. Where frequent access to any location is needed, stairways or fixed ladders should be installed.

Standards. In buying wood ladders, the purchaser has two reliable guides. One is the label indicating the product has been built according to the strict specifications of the American Standard Safety Code for Portable Wood Ladders, A14.1-1952.

Many ladders also carry the label of Underwriters' Laboratories indicating the ladder has passed the laboratories' rigorous tests.

Metal ladders are covered by American Standard A14.2-1956. Standards for aluminum and magnesium ladders had previously been established by the Metal Ladder Manufacturers' Association.

#### Definitions

Nine types of ladders commonly used in industry are defined in the American Standard Safety Code:

1. Stepladder. A self-supporting portable ladder, non-adjustable in length, having flat steps and a hinged back. Size is designated by over-all length of ladder measured along front edge of side rails.

- 2. Single ladder. A non-self-supporting portable ladder, non-adjustable in length, consisting of but one section. Size is designated by overall length of side rail.
- 3. Extension ladder. A non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Size is designated by sum of lengths of sections measured along side rails.
- 4. Sectional ladder. A non-self-supporting portable ladder, non-adjustable in length, consisting of two or more sections so constructed that the sections may be combined to function as a single ladder. Size is designated by over-all length of assembled sections.
- 5. Trestle ladder. A self-supporting portable ladder, non-adjustable in length, consisting of two sections hinged at the top to form equal angles with the base. Size is designated by length of side rails measured along front edge.
- 6. Extension trestle ladder. A selfsupporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. Size is designated by length of trestle ladder base.
- 7. Special-purpose ladder. A portable ladder which represents either a modification or a combination of design or construction features in one of the general purpose types of ladders previously defined to adapt the ladder to special or specific uses.
- 8. Trolley ladder. A semi-fixed ladder non-adjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion.
- 9. Side-rolling ladder. A semi-fixed ladder, non-adjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also in its plane of motion.

#### **Materials and Construction**

Wood, which meets the requirements of weight and strength at moderate cost, is the most widely used material. Acceptable kinds and grades of wood are listed in the ASA Code.

Ladders may have either spreading or parallel straight lines. They may have sides flaring at the base



## SAFELY... on your stairs?

Unless your stairs and floors have been so carefully protected that a handicapped person could use them with ease, you are inviting accidents! Part of this needed protection comes from using the proper floor finishing and maintenance materials.

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to increase stability, and converging at the top for specific uses.

Laminated ladders. Side rails of laminated wood have high strength-weight ratio, are able to carry substantial loads after initial failure, and give distinctive sound warnings as failure progresses gradually.

Laminated ladders are available in single and two-section extension ladders and several specialized types.

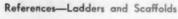
Light metals. Aluminum and magnesium alloys are light in weight and resistant to moisture. In case of overload there is deflection warning instead of sudden breakage. Prices are higher than for wooden ladders.

Metal ladders should be free from sharp edges and burrs on the side rails. Soft metal rivets that might shear off under load should not be used.

Single or extension ladders, stepladders, platform ladders, and planks, stages and hangers are available in light metals.

Caution: Metal ladders are conductors of electricity and should not be used around electrical equipment. Decals or painted warnings against such use should be carried on all metal ladders.

Glass fiber and plastic. A new type of lightweight ladder uses a sandwich construction of glass fiber



#### **National Safety Council**

Accident Prevention Manual for Industrial Operations, 1955.

Ladders, Aluminum and Other Metal; Reprint Gen. 7.

#### National Safety News

Facts and Fancies About Ladders; L. J. Markwardt and Alan D. Freas, Feb. 1950. Protecting Wood Ladders from Decay; Feb. 1950.

Rolling Scaffolds; July 1951.

Safer Maintenance with Swinging Scaffolds; May 1952.

Safe Ladders, Safely Used; L. J. Mark-

wardt, May 1956. Code Sets Standards for Fixed Ladders; Robert L. Moore, May 1957.

You Can Depend on Metal Ladders; June 1958.

Scaffolds for Building Demolition; Aug. 1958.

#### American Standards Assn.

Portable Wood Ladders, Safety Code for, A14.1-1952.

Portable Metal Ladders, Safety Code for, A14.2-1956.

Fixed Ladders, Safety Code for, A14.3-1956.



NOTHING has been overlooked here. Ladder is in good condition and crosspiece has been attached for use against window opening. Ladder is equipped with shoes but man on ground is holding ladder. To detout traffic, sign is supplemented by horses.

and polyester resin. Advantages claimed are high strength-to-weight ratio, non-conducting qualities and resistance to corrosion. Glass fiber reinforced side rails are plastic welded with aluminum or magnesium rungs to form an integral part of the ladder.

Standard single ladders, 8-16 ft., and extension ladders, 16-28 ft., weigh approximately 2 lbs. per ft. In the heavy-duty grade single ladders, 8-20 ft., weigh 2½ lbs. per ft. and extension ladders 2½ lbs.

Stepladders are available in lengths up to 20 ft. Three types are listed by the Code:

- 1. Heavy duty-4 to 20 ft.
- 2. Medium duty-4 to 12 ft.
- 3. Light duty-3 to 8 ft.

More substantial construction is, of course, specified for the longer, heavier-duty ladders.

The front section should have level treads when in the open position.

The rung-back stepladder permits a helper to assist from the back of the ladder.

A spreader or locking device of sufficient size and strength to hold front and back sections securely in the open position is important.

A bucket shelf is useful for many jobs. It should support a load of 25 lbs. and be fastened so it can be folded up when the ladder is closed.

Platform (safety) ladders are a development of the stepladder. They provide a solid working platform guarded on three sides.

Safety ladders are usually built for heavier duty than the ordinary

stepladder.

Height to platform ranges from 3 to 18 ft., over-all height being 2 ft. more.

Pyramid safety ladders, made of aluminum or steel, provide a secure, well-balanced platform for work at heights up to 15 ft. Rubber-tipped feet hold the ladder in place while work is done and casters permit easy movement.

Single ladders up to the maximum length of 30 ft. specified by the Code are available. For sizes larger than 24 ft., extension ladders are easier to store and transport.

Sectional size of rails varies with the length of the ladder and diameter of rungs increases with the width of the ladder between side rails.

Diameter of rungs should be not less than 1½ in. Holes for rungs may extend through the side rails or be bored to give at least 13/16 in. of bearing to the rung tenon.

Oilers' ladders are provided with hooks at the top so the ladder may be securely fastened to overhead shafting.

Extension ladders. Two-section extension ladders up to 60 ft. in length are recognized by the Code. Specifications for dimensions of side rails and type of wood permitted vary with the length of the ladder.

Minimum overlap for ladders up to 36 ft. is 3 ft.; from 37 to 48 ft., 4 ft.; from 49 to 60 ft., 5 ft.

Smaller side rails on rung-type ladders are acceptable when reinforced by steel wire running the length of the side rails and securely fastened to them.

Locks must be positive in action. Guide irons must be securely attached to the ladder and so placed as to prevent the upper section from tipping or falling out while raising, lowering, or in use.

Rope and pulley for raising and lowering, while not mandatory, are desirable.

-To page 44



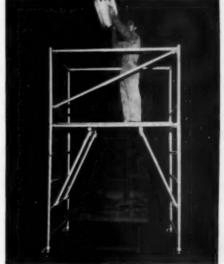
# Aluminum Rolling Scaffold RAISES Efficiency ...LOWERS Maintenance Costs

Preventive maintenance is an economic necessity which accounts for millions of dollars of savings in equipment and materials each year. It can be costly in time, labor and life. However, when the job calls for getting off-the-ground . . . there's no safer, more economical way than with Aluminum Stairway Scaffolds. Scientifically designed, they are available in two basic styles. Aluminum Sectional Scaffolds are erected from separate frames, braces and stairways. All sections of "Fold-A-Way" Scaffolds fold into compact units. Base dimensions of both types are 4'6" x 6'. Sectional Ladder Scaffolds can be 29" or 4'6" wide in lengths up to 10'. Both styles are UL Approved. Shown at right: High clearance base section for all four scaffold types. Write for BULLETIN G-205RR

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#### **Dependable Scaffolds**

For off-the-ground jobs

SCAFFOLDS of many types have been developed for construction and maintenance work. These range from light movable work platforms for maintenance and repair jobs to the sectional steel scaffolds used in large building projects.

Types of scaffolds. Three principal classifications are:

- 1. Built-up. Steel sectional frame; tube and coupler.
- 2. Hanging. Heavy-duty suspended; light-duty swinging.



ROLLING SCAFFOLDS of many types find many uses in industry. Above is a stairway type aluminum sectional scaffold. For taller scaffolds outriggers are needed for stability. (Patent Scaffolding Co.)

 Rolling. Movable units made by fitting casters to built-up scaffolds or to special aluminum components.

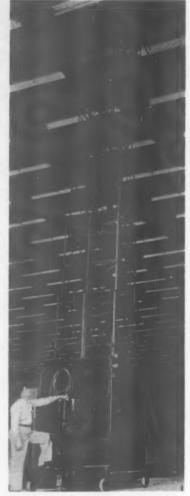
Wood scaffolding, erected on the job by the contractor's men, is not included in this article. Details for safe construction will be found in the NSC Manual of Accident Prevention for Industrial Operations and in construction manuals.

Tubular steel scaffolds are used on large jobs where work is carried on at great heights. Scaffolds may be purchased or rented. When rented, erection and dismantling by experienced crews are included in the contract.

Steel scaffolds, except for wood planks, are noncombustible. They offer less resistance to wind than all-wood scaffolds. Interchangeable parts make the scaffolding adaptable to a variety of jobs and facilitate erection and dismantling.

Rolling scaffolds can be erected from sectional steel scaffolding components or tube - and - coupler scaffolding components and fitted with casters. There are three other types of rolling scaffolds:

- Sectional ladder scaffolds of steel or aluminum.
- Sectional aluminum scaffolds with interior or exterior stairway.
- 3. Scaffolds made of folding onepiece sections.



TELESCOPING PLATFORM permits safe access to lighting fixtures at various mounting heights.

Sectional rolling scaffolds should not be erected higher than permitted by governing codes, which usually require that the shortest base dimension be one-fourth of the platform height. Base dimensions can be increased by outriggers.

These workstands provide more space than a platform ladder, permit more than one man to work and provide more space for tools.

Workstands of the wheelbarrow type can be moved easily by one man.

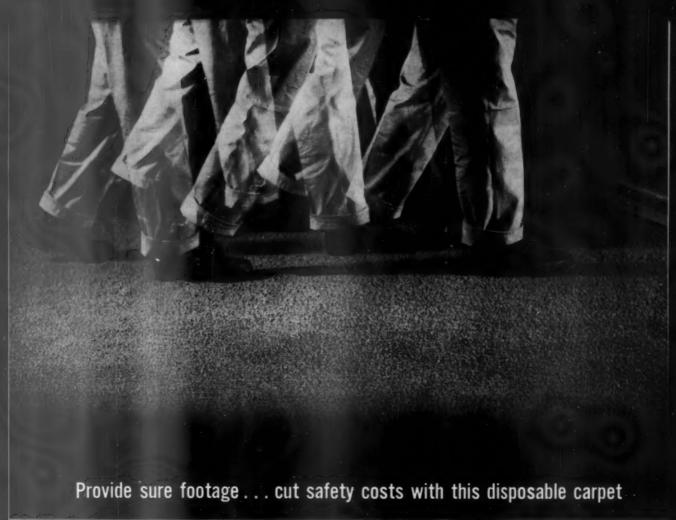
Telescoping portable towers are used for some maintenance work.

Caster locks should be provided on movable equipment to prevent movement while in use.

-To page 44

#### **EQUIPMENT FOR REACHING VARIOUS HEIGHTS**

TYPE OF EQUIPMENT				Above 30 ft.
Catwalk or truss	_	_	×	×
Crane (where available)	-	_	×	×
Crow's nest ladder		_	×	_
Disconnecting hanger	_	_	×	×
Portable maintenance platform	_	×	×	_
Relamping bridge	-	_	×	×
Stepladder	×	×	_	_
Straight ladder	_	×	_	_
Telescoping platform, elevating tower, etc	-	×	×	×







Do you know how much slippery floors can cost? Statistics show that falls cause approximately 18%\* of all compensable work injuries. Let's be more specific—figure out how much falls cost in your plant:

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\*\*\* of injuries caused by falls

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#### Ladders

-From page 40

Trestle ladders (A-type with center section which slides up and down) are used in maintenance work. These ladders are commonly used in pairs with a stage between them or in sets of four with two stages and with planks from stage to stage.

In selecting extension trestles, look for guides of adequate length, strong locks of the sliding section, and a safety spreader.

Telescoping ladders are mounted on rubber-tired ball-bearing wheels with floor locks. Maximum height of working platform is 15 ft. When down, they will go through an ordinary door or into an elevator.

Telescoping towers can be extended up to 49 ft. The man on the platform controls the travel through an electric push-button system. Another push-button control is located on the frame below, but the man above can lock the platform in place by pressing a safety button. Outriggers give stability.

Chain and rope ladders are for emergency use as a means of escape in case of fire or explosion, and for rescue work where rigid ladders cannot be used. These are not substitutes for permanent fire escapes.

Crow's nest ladders. For many outdoor maintenance jobs the "crow's nest" ladder mounted on a truck is used. It is an extension platform ladder, securely mounted on the vehicle, which can be rotated in a complete circle and elevated at angles from 45 to 72 degrees from the vertical.

This device permits working over parked vehicles and is used for tree trimming, servicing street lights, police and fire alarm signals, inspecting overhead lines, connecting house services, and general emergency work. It can be lowered for traveling.

#### Safety Accessories

Ladder shoes. Whenever a portable ladder is used on anything but dry ground, there is possibility of the feet slipping. To overcome this hazard, several types of ladder shoes

have been devised. They grip the surface by sharp points or by friction.

One type of sharp point is the metal spike; another is the abrasive shoe. The friction type depends upon frictional resistance for the gripping qualities of cork, lead, and rubber or neoprene with interwoven cord.

Another type made of cotton asbestos material and interwoven wire combines the two principles. Suction cups are used in still another type.

Ladder shoes become less effective through wear, especially when exposed to oil and grease on the floor. Consequently, they should be inspected regularly.

Stabilizers. When a ladder is used on an uneven surface, hydraulic stabilizers attached to the feet keep a ladder firm and steady. These can be attached to any straight or extension ladder.

#### Maintenance

Inspection. Look for: loose rungs or steps; screws, bolts, and other metal parts broken or missing; cracked or broken uprights, braces, steps or rungs; slivers; worn or damaged shoes.

Defective ladders should be marked and taken out of service until defects have been corrected. If beyond repair, they should be destroyed promptly.

Records of the condition of each ladder should be kept.

Storage. Ladders should not be stored where they will be exposed to weather, nor near radiators, stoves, or steam pipes.

**Protective coatings.** Two coats of linseed oil or spar varnish will increase resistance to weathering.

Painting is permitted by the ASA Code, if ladders are inspected before painting by experienced inspectors acting for the purchaser and ladders are not for resale. Transparent coatings, however, are preferred by many users.

Wood preservatives, which consist of toxic chemicals in non-aqueous solution, prolong the life of wood exposed to weather or in contact with the ground. They offer special protection at the joints or rung holes and tenons.

Preservatives of the NSP type (non-swelling, paintable) do not interfere with subsequent painting and varnishing. \* \* \*

#### Scaffolds

-From page 42

Swinging scaffolds are light-duty equipment primarily for men and hand tools. They are used for painting, tuck-pointing, glazing, and other operations where scaffold height is adjusted frequently as work progresses.

A swinging scaffold should be hung securely from eaves, cornices, or other reliable support, with strong hooks. Anchorage should be inspected before hooks are placed.

Ropes should be of best grade manila not less than 3/4 in., on at least 6-in, blocks.

Steel cable should be not less than 5/16 in. Steel cable is wound on a drum, not pulled by hand.

Safety belts attached to life lines extending from the roof to the ground should be worn by workers on swinging scaffolds. The safety belt rope should be tied to the life line with a triple sliding hitch.

Suspended scaffolds are supported by outrigger I-beams attached to the frame of the building. They are recommended for use on buildings more than 5 stories high which have a frame to provide the overhead support. The scaffold is raised and lowered by steel cable operated by a winch.

Shackles or beam clamps holding cables should be securely fastened to outriggers with a stop bolt in the outer end of each outrigger. Cables should be securely fastened to outriggers and to the putlogs which carry the platform, or to the hoisting machines.

Ladder-jack scaffolds are used chiefly by painters and electricians. They should not be used more than 22 ft. above ground or floor or on extension ladders. An unsupported span should not be more than 10 ft.

Railings and toeboards. Most codes require railings on scaffolds

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Recommend a neutral cleaner for safe maintenance.

They warn against the damaging effects of acid cleaners — strong alkaline cleaners or cleaners containing solvents, free oils or abrasives. Any floor — hard or soft can be attacked and ruined with these harsh cleaners. Even modern water softening synthetic detergents will attack any floor or grout containing colcium compounds.

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There's only one cleaner universally safe for your floors—a neutral cleaner—and there's only one like Super Shine-All that chemically cleans with neutral safety. Approved by American Hotel Assn., Rubber Flooring Mfg. Assn., and U/L listed as slip-resistant.





SUPER SHINE-ALL—is more than an effective cleaner. It fills and seals. Instead of robbing essential oils or reacting harmfully with the floor itself Super Shine-All feeds and heals the surface and soon you're walking on a Shine-All sheen.

Won't eat away or destroy good wax film. No etching or pitting to cause dirt traps. No-rinsing saves labor time. Try Super Shine-All. You get more for your money. It conditions as it cleans.

Ask the Hillyard "Maintaineer®" for expert advice on treatment and maintenance of your floors. He can suggest modern, streamlined work methods that mean real savings in your maintenance budget. He's "On Your Staff, Not Your Payroll".



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Circle Item No. 21—Reader Service Card

#### Scaffolds

-From page 44

more than 12 ft. high, but railings are desirable on lower scaffolds. A top rail should be 36-42 in. above the floor with an intermediate rail halfway between the top rail and the walkway surface.

Toeboards are needed to prevent tools or materials from falling.

Overhead protection, consisting of planking heavy enough to stop any falling object, should be provided for scaffolds when men are working overhead. This protection should be not more than 9 ft. above the working platform.

Sidewalk bridges. Where construction or repair work is carried on over sidewalks, protection for pedestrian traffic is needed. Sidewalk bridges of adequate strength are provided by companies furnishing sectional steel scaffolding. \* \* \*

#### Floors

-From page 22

base it will take heavy trucking. The surface is somewhat harder than the hot mastic type. Both types are affected by oils, solvents, and heat.

Mastic flooring of other types usually has a resin binder. The materials are generally resistant to oils, solvents, and alkalis, but the manufacturers should be consulted about the exposure. These materials are relatively high in price and are used principally for patching and for resurfacing limited areas.



OIL ABSORBENT applied promptly on spills keeps floors clean and prevents many a fall

Ceramic tile is frequently used where oils, acids, or alkalis are present and in food product plants where floors must be washed frequently.

Asphalt tile is suitable for offices, stores, light manufacturing areas, and floors below grade. Several grades are available: industrial, standard, greaseproof, conductive, and greaseproof-conductive. It is moisture resistant but susceptible to indentation. It should be laid over a rigid base.

Asphalt tile is lower in price than other resilient flooring materials. It is non-slippery in its normal state and can be kept in good condition with non-slip floor finishes. Solvent waxes will cause deterioration.

Linoleum is quiet and comfortable underfoot. It is used in offices, laboratories, and workrooms where cleanliness and appearance are important. Heavy gauge linoleum will withstand loads up to 75 psi. without permanent marking. Since highly polished linoleum is extremely slippery, the choice of a finish is important.

Rubber is resilient and durable when not exposed to oils and solvents. It has high dielectric strength which is undesirable where static electricity is a problem. Conductive types of rubber flooring are suitable for such locations. Abrasive rubber flooring is useful for stair treads, elevator sills, and thresholds.

Vinyl plastic, usually in tile form, is durable and decorative but relatively high in price. It resists acids, alkalis, and most organic solvents. The surface is non-porous and easy to keep clean.

Wood block is widely used for heavy duty general purpose floors. It is durable, relatively quiet and comfortable under foot and does not become slippery. Blocks laid on a smooth, rigid base will stand up under heavy trucking and are not likely to crack. Blocks impregnated with creosote resist dampness.

Blocks should be set in highmelting-point pitch.. Ordinary pitch or tar filler may stick to wheels and shoes in hot weather.

Wood plank. Close-grained wood

is comfortable and reasonably durable under foot traffic. Under moist conditions, boards may swell and buckle. A heavy subfloor makes surface flooring more resistant to moisture and traffic. Under heavy wheel traffic, boards may loosen or break frequently, causing hazardous conditions and excessive maintenance. A penetrating floor seal protects the surface and makes cleaning easier.

Fabric surfacing. Heavy fabric coated with mineral grains is used indoors and out for stair treads, ramps, and around machines. The material can be applied to concrete, metal, or wood. It is backed with adhesive to the surface under pressure. It wears well and resists water, oil, and weather.

Steel plates are serviceable for platforms, stair treads, floors, hatchways. They wear well and are easily cleaned but are noisy and highly conductive of heat.

Extruded patterns offer good traction and resistance to slipping. When worn, plates can be roughened with a welding torch.

Steel plates are also used over ducts which carry electric circuits or pipe lines. They are easily assembled and can be removed for servicing equipment.

Magnesite is suitable for light traffic. It must be laid on a rigid base. It should not be used where there is excessive moisture or hydrostatic pressure, as in basements. It is resistant to oil. A coat of bituminous paint should protect metal



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#### Floors

-From page 46

surfaces in contact with magnesite since it corrodes some metals.

Terrazzo is durable and easily maintained. Abrasive aggregates in the mixture provide a non-slip surface. Scalers make it impervious to most acids. Where there is excessive foot traffic, as in building lobbies, rubber mats reduce slipping hazards and protect the surface.

Lead is used for floors exposed to acids and as insets or mats for secure footing in operation of woodworking machines or other places where the results of a slip and fall would be unusually serious. Lead is conductive of heat, nonsparking, and quiet.

Zinc is non-sparking and sometimes used in such locations as compounding rooms where fire and explosion hazards exist. Zinc is not resistant to acids and alkali. \* \* \*

#### Care of Floors

Floors of all types last longer if properly cared for. A protective coating is usually desirable.

Hardwood flooring in its natural state dries out and cracks and splinters under traffic. Scrubbing raises the grain of the wood and excessive moisture causes it to swell and warp. Sealers, enamels, and varnish are used as protective coatings. Sealers penetrate the wood and produce a durable finish.

Concrete resists moisture but has a tendency to dust under traffic. This can be checked by treating with a sealer. If color is desired, a penetrating dye or a floor enamel may be used.

Linoleum, vinyl, asphalt tile, and rubber tile are impervious and decorative. Care consists of cleaning and preserving the surface. As little water as possible should be used in cleaning.

Wax protects the surface and preserves appearance. It makes regular maintenance easier by keeping dirt from being ground into the floor.

Water emulsion (self-polishing) wax can be used safely on all types of floors. Buffing waxes contain solvents which injure asphalt and rubber. Either type may be used on vinyl floors.

Self-polishing waxes are considerably less slippery than buffing waxes. Tests have been made to determine the fractional resistance of various floor finishes on different types of floors. However, it has not been found possible to give any finish a rating which would apply for all surfaces and all conditions.

Floor cleaners should not leave a slippery film. Soap is permissible for such surfaces as concrete, common brick, wood block, and mastic. For marble and smooth tile a cleaning powder that does not leave a slippery residue should be used.

Strong alkalis and coarse abrasives are injurious to many types of floors, and usually milder cleaners will be effective.

Standards. Floor coating and finishing materials are listed by Underwriters' Laboratories Accident Equipment List in three classes. Materials listed have been found to have slip-resistant characteristics of not less than 0.5 as determined by the static friction test method of U.L.

#### I. Floor Treatment Materials (FTM)

1. Water-base materials.

Fillers, sealers, varnishes, and similar materials.

3. Detergents.

4. Abrasive-grit-bearing liquids.

5. Waxes, other than water base.

6. Sweeping compounds.



TEST PANEL for testing various types of flooring materials and finished for durability and anti-slip qualities.

(The Gas and Oil Equipment List lists materials according to fire hazard classification.)

II. Oil and Grease Absorbents (OGA)

III. Walkway Construction Materials (WCM). Includes floor plates and stair treads made of:

1. Natural stone.

2. Composition.

3. Abrasive-grit-surfaced materials.

#### Oil Absorbents

Around machines and other areas where oil and grease accumulate, hazardous and unsightly conditions develop. Oil spills should be cleaned up promptly. Non-combustible absorbents keep floors cleaner and reduce slipping and fire hazards.

Absorbents are of two types one for oils and greases; the other an all-purpose absorbent where water and other liquids are also present. They have a much greater absorbing capacity than sawdust, waste, or rags, are non-combustible, and less bulky.

Absorbents are not subject to spontaneous heating unless the absorbed oil has that characteristic.

Oil-soaked garments, shoes, ropes, and belts can be dry-cleaned by burying in the compound.

Sweeping compounds keep down the dust from dry sweeping. These are listed by Underwriters' Laboratories (Gas and Oil Equipment List) in two groups: Class I, noncombustible; Class II, slow-burning. Tests include combustibility, behavior on heating, and spontaneous heating characteristics. \* \* \*

#### Housekeeping

-From page 28

lids are best, particularly where oily rags and waste are deposited. Containers painted a distinctive color call attention to their presence.

Large containers (4 to 8 cu. yds.), equipped for automatic attachment and release from a disposal truck, may be located strategically on the plant grounds. The smaller containers are emptied into these by the housekeeping force.

Steam-cleaning units, which deliver jets of steam and cleaning solution under high pressure, are used to clean some types of processing and fabricating equipment and to



## D EXPLOSION

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Model 355



Model CX



Model 355-Heavy duty, big volume 55 gallon wet and dry pickup vacuum cleaner-UL listed for Class II, Group G use. Has new thermal safety switch for complete protection against motor burnout, handy drain valve for rapid draining of liquids plus complete selection of attachments for almost every vacuum cleaning job.

Model CX-The first UL listed explosion proof floor machine listed by Underwriters' Laboratories for Class II, Group G use. Available with easy interchangeable brush attachments for fast scrubbing and polishing of all types of floors. Every detail designed and built to the very highest safety requirements.



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Circle Item No. 23-Reader Service Card

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Available in extension, single sectional and step ladders.

Also Oak Rolling and special ladders for stores, warehouses, file rooms.

PUTNAM Rolling Ladder Co., Inc. 32 Howard St., New York, N. Y.



remove stubborn deposits of dirt from floors, walls, and ceilings.

Stationary and portable units are available.

Smoking areas are now provided in most plants where smoking on the job is not permitted. Receptacles which will not slip and spill their contents should be provided for cigaret butts and ashes.

#### **Cleaning Supplies**

Improvements in mechanical cleaning equipment have been matched by the development of more efficient cleaning materials.

Disinfectants and deodorants are useful, particularly for washrooms and garbage cans. They are not substitutes for detergents.

Odors may indicate unsanitary conditions or may be merely a nuisance. The source should be removed if possible, but a deodorant may be needed.

Much research has gone into cleaning techniques. Manufacturers can furnish helpful data on housekeeping and maintenance.

Detergents. Water actually does the cleaning but usually it needs the aid of a detergent—soap, an alkaline cleaner, or a synthetic cleaning compound. Soap is a detergent, but not all detergents are soaps.

There are three types of dirt: Water soluble matter, oils and greases, and inert solids.

A cleaner removes dirt by dissolving, emulsifying, or suspending it.

Soap is one of the oldest cleaners and a most useful one. It has one serious defect—the formation of curds in hard water. As soaps leave a film, careful rinsing is necessary, particularly in those compounds which do not include adequate sequestering or chelating agents.

Synthetic detergents are derived from sources other than fats and oils. Petroleum and coal tar derivatives and the by-products of some industries provide the raw materials. These cleaners can be used with hard water.

Alkalis such as washing soda,

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\* Trademark of Oil-Dri Corporation of America

6 Colors: Red, Grey, Black, Yellow, Sea-Green & White. Easy to apply— Brush or spray like any paint.

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Circle Item No. 25—Reader Service Card

#### JANITORS' AIDS

Vacuum cleaner—Heavy-duty with attachments.

Floor machine—Size, type, and attachments for the job.

Brooms, brushes, mops, buckets. Cheesecloth.

Cheesecloth.

Rubber or plastic gloves. Bowl and urinal swabs.

Detergents—Soap or synthetic.

Disinfectants and deodorants.

Wax—Suitable for type of floor.

soluble silicates, and various phosphates form the third class of cleaning materials. Compounds of these are marketed under a variety of trade names. They are useful where sudsy cleaners are not desirable, but dilution strengths must be closely controlled to avoid damage to surfaces. They do not form a slippery film on floors.

Hand Protection. Since many cleaning materials are too powerful for safe use on the skin, rubber or plastic gloves are often needed.

#### The Plant

-From page 18

Roofs. Flat roofs or those with few projections are comparatively low in cost. Monitor and sawtooth roofs admit light and air to the center of the buildings, but are more expensive to build. Modern light sources rivaling natural light make daylight less important.

#### **Materials Handling**

Materials are moved in and out of the plant by highway, railroad, water, and sometimes, by air. More than two of these methods seldom are needed.

Loading docks should be planned for traffic both outside and within the plant.

Studies of the flow of materials through a plant—from their receipt, through processing, until they are shipped out as finished products—often reveal ways to reduce handling operations as well as hazards.

Adequate clearances between vehicles and fixed structures must be provided. This is particularly

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## Sure-foot protection for your plant!



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Sure-Foot costs less than 10¢ a square foot for 2 coats—including application. Applied by brush, roller or squeegee, Sure-Foot flows on easily covering smooth or uneven surfaces—wood, concrete or metal. It dries overnight to a tough, hard, non-skid finish that lasts for years.

Applications of Sure-Foot are unlimited. On plant premises, equipment, machinery or manufactured products, wherever there's a slipping hazard, paint on protection economically . . . with Sure-Foot.

Sure-Foot is available in eye-easing gray, red, black and green as well as traffic yellow. For plant zoning, Sure-Foot traffic yellow can't be beat. It's super-tough... lasts 3 to 4 times longer than ordinary zoning paints!



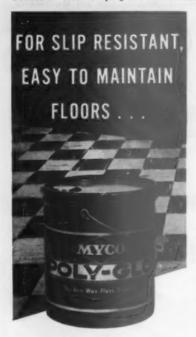
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important in plant railways and driveways.

Waste material must be removed constantly. Junk accumulates when efficient removal facilities aren't provided.

#### **Machine Layout**

The work station. Each operator should be able to sit at, stand at, and move safely about his machine, bench, desk or other equipment.

He must be able to get into that space without slipping, bumping objects, striking overhead objects, or coming into contact with live electrical parts or moving parts of machinery.

He must have room to move material being processed. He must also have space for hoists, lifts, or hand or power trucks.

In continuous - line operation where machines are served by conveyors, little or no intermediate storage space for materials is necessary. In other types of operation, added space for storage of raw and finished materials is essential.

Insufficient headroom is a hazard. "Temporary" installations of pipelines, equipment supports, overhead conveyors, and other installations that might cause head bumps often can be avoided. Elevation drawings should be studied to determine location of potentially troublesome equipment.

Vertical clearance of at least 7 ft. should be provided, especially over aisles, passageways, and stairways. Where this is not practicable, overhead obstructions should be padded or marked by contrasting paint.

Storage space for raw and finished materials must be adequate to avoid confusion, bad housekeeping, fire hazards, overloaded floors, and damaged stock.

Supplies, tools, safety equipment, small parts, and equipment not used regularly should be stored in convenient locations.

Maintenance is facilitated when such items as personal protective equipment, ladders, and hoisting equipment are readily available.

Safe access to all parts of the plant should be provided.

Stairways are first choice where conditions permit.

Fixed ladders may be used where space is limited.

Portable ladders are acceptable where need for access is relatively infrequent.

Stairs for general use should be convenient to areas served, have standard handrails and be free from obstructions at top and bottom.

#### In-plant Traffic

Free movement of power trucks, hand trucks, and tractors in and about buildings requires adequate clearance in aisles, corridors, and passageways, and at corners and curves.

Aisles, particularly main traffic aisles, should be of generous width, straight as possible and free from obstructions. Where possible, corners should be cut off on a diagonal and visibility unobscured.

If vehicles must pass, the aisle should be at least twice the width of the widest part of the vehicle or load, plus 3 ft.

If traffic is not heavy, the aisle can be of a width equal to the maximum width of the vehicle or



#### SANI-DRI HAND DRYERS

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Circle Item No. 28—Reader Service Card National Safety News, March, 1959 load, plus 2 ft., provided passing zones are established at intervals of from 150-200 ft. One-way traffic aisles may help.

Aisles should be marked by colored lines—safety orange or white. Permanent markers, such as metal or plastic disks, also are suitable. Floors should be kept clean and defect-free.

Aisles should be well lighted. If not lighted at night by general lighting, night lights should be provided for service employees or off-shift workers. Emergency passageways should be marked by standard exit markers.

Cross aisles should be avoided at tops and bottoms of ramps. Aisle and ramp should be in a straight line.

Pedestrian traffic. Aisles should be proportionately wider to accommodate rush traffic to time clocks, lunchrooms and exit gates. Main aisles up to 20 ft. wide and cross aisles not less than 8 ft. wide are desirable.

Where foot traffic parallels rail-

ways or other fixed traffic carriers, adequate clearance should be provided to allow the aisle edge to be marked by a conspicuous line on

Gates, warning signals, or signs and barricades should be provided. Where traffic is heavy, underpasses or bridges for vehicular and pedestrian traffic should be considered.

**Protective** lighting safeguards life and property, particularly in emergencies.

Fences high enough and strong enough to deter trespassers also are valuable in plant protection.

#### **Keep Up Appearances**

Appearance of the plant—inside and out—is important. Employee and community relations are helped by the looks of a factory, and customers often judge the product by the plant. The housekeeping program should include the entire property.

Landscaping should be planned for economical maintenance. With power mowers and sweepers, a small force can take care of a large lawn if it is not broken up by shrubbery and flower beds. Trees are an asset to company and community.

Decorative floodlighting is used by many companies with distinctive buildings and well-kept grounds.

#### DRI-RITE WATER, OIL AND GREASE ABSORBENTS



Dries and cleans floors—Absorbs water, oil and grease—Eliminates scrubbing. Prevents slipping accidents.

Dri-Rite quality absorbents have been proven in use by large and small industrial plants for many years.

Exclusive Territorial
Distributorships Available

#### The DRI-RITE COMPANY

100 W. Chicago Ave., Chicago 10, III.

Circle Item No. 29—Reader Service Card

#### Rodent and Insect Control

RATS, MICE, AND INSECTS eat, destroy, and spoil millions of dollars worth of food and other materials every year. These pests are also carriers of many diseases.

An effective program of rodent control has three parts:

- Sanitation—taking away food and shelter.
- Ratproofing—building him out of places where he can get food and cover.
- Reduction—by various methods of killing. Without the other two methods, reduction can be only temporary.

Rodents cannot exist without food, water, and shelter. This makes good housekeeping vital for factory,



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ENGINEERS,

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Circle Item No. 30—Reader Service Card



## BALLYMORE "Hi-boy" LADDERS

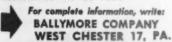
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**BALLYLOCK** floor locking



ALL-WELDED STEEL FOR REACHING HEIGHTS UP TO 15 FEET



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ABOVE-FLOOR SAFETY

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Circle Item No. 31—Reader Service Card

home, and farm-indoors and out.

Scraps from the kitchen and from employees' lunches should be placed in covered metal containers. Spilled grain or other edible materials should be swept up daily.

Ratproof construction helps to keep them out of a building. Concrete, bricks, and metals of 24-gauge or heavier are effective. Hardware cloth screens should have not more than ½-in. openings—for mice ¼ in.

Material stored on the ground provides shelter. Rodents will have difficulty getting established if material is stored on racks 18 in. above ground.

Extermination. Traps, gases, and poisons are still the most effective methods of keeping down the rodent population. Their natural enemies, such as dogs, cats, ferrets, snakes and hawks, are not dependable and some of them, obviously, are not desirable pets.

Many types of traps have been devised but the old wooden bait trap is still widely used.

Poisons. Red squill has long been a popular and effective rat killer. It acts as an emetic on other animals but rats and mice cannot vomit and death results.

Warfarin is also relatively harmless to most other animals and to human beings. It is used in establishments handling food products where more toxic substances could not be used safely.

More powerful poisons, such as thallium sulfate and sodium fluoroacetate (1080) are not for amateur use.

Many other rodent killers introduced in recent years have been discarded because they had too many disadvantages.

Fumigation. Use of fumigant gases indoors is not recommended for nonprofessionals. Carbon monoxide can be used in outdoor places. A hose attached to an automobile exhaust is put down the burrow.

Chloropicrin has the advantage of being repellent. A heavy application is said to make a burrow uninhabitable for several months.

Calcium cyanide can be applied to burrows with a foot pump. It should not be used indoors where there may not be enough moisture to liberate cyanide, thus creating a delayed hazard. The gas is lighter than air and outdoors it dissipates rapidly. It has a strong warning odor.

Methyl bromide, an effective gas, should be used only by professional exterminators.

Insecticides. Wherever food is grown or processed, a constant fight must be waged against insects. For farm and garden the traditional poisons such as lead arsenate, Paris green and nicotine sulphate have been supplemented by much safer products, such as rotenone, pyrethrum, and DDT.

No insecticide, however, should be considered harmless. The user should avoid inhaling dust or spray of any kind and allowing any of it to remain on the skin. For extensive use, protective clothing and gloves and a respirator may be desirable.

Lethal fumigant gases are used for exterminating weevils, moths, beetles, and other insects. Carbon disulfide is effective for controlling weevils in grain but it is highly toxic and highly flammable.

Fumigation should be done only by licensed fumigators.

### THE POSITIVE LADDER SAFETY DEVICE LOCKS-IN-A-NOTCH



### Prevents death and injuries from falling.

If climber starts to fall, device locks in a deep notch on carrier rail and limits fall to approximately 6 inches distance between notches.

#### LOCKS AUTOMATICALLY and INSTANTLY—HOLDS SECURELY

Will catch and hold workman if he starts to fall, even if unconscious. Cannot slip on down ladder. Requires no attention from climber; he climbs in normal manner. Inexpensive. Easy to install; 3 men can clamp it to ordinary ladder in few hours. Clamps to any rung ladder, peg ladder, pole or framework. No welding or cutting. Notched rail hot-dipped galvanized. Entire equipment rust and corrosion proof. Can be kept free of ice by applying heat inside the carrier roil. In use approve 11 years. Approved by Safety Engineers and Govt. Agencies throughout country. Patented. Manufactured and was a superior of the country.

SAFETY TOWER LADDER CO.

Circle Item No. 32—Reader Service Card National Safety News, March, 1959 Storage of Pesticides. One person should be assigned responsibility for handling and storage. Containers and sprayers should be painted a distinctive color, with contents, uses, and hazards plainly marked. These materials should be kept under lock and key and used only by members of the sanitation squad. \* \*

#### Safety and Efficiency In Office Planning

Efficiency, convenience, and safety require careful planning in office, as well as factory. Essentials of a good working environment vary only in details with the nature of the operations.

Many of the principles of work flow apply to workplaces.

Light, ventilation, washrooms, and other employee services have an important influence on employee morale.

Housekeeping has values far beyond the appearance of the office and its influence on employees and visitors. It contributes to health and to the elimination of slipping and tripping hazards.

#### COTTERMAN

#### WELDED STEEL SAFETY LADDERS

For Filing Rooms - Stock Rooms - Vaults



Frame work made from heavy gauge 1" diameter round steel furniture tubing, with all joints electrically welded. Mounted on Swivel Brake Casters which allow the ladder to be rolled freely when no one is on it. When you step on the ladder the rubber cushioned legs rest on the floor and prevent rolling.

Made in 13 heights—from 12" 1 Step to 117" 13 Step, and in 4 widths—18", 20", 26" and 32", with and without hand and platform rails.

We also manufacture the COTTERMAN TRUCK - N - LADDER A Truck and Ladder combined in a single unit. Write for Folder No. 56-N for complete information and prices on both these items.

Manufactured by

#### I. D. COTTERMAN

123 W. Spring Ave.

Naperville, III.

Cirice Item No. 33—Reader Service Card National Safety News, March, 1959 1. Layout. Work should flow through the office with a minimum of backtracking.

Transportation distance of work should be at a minimum. Desks should be arranged, so each worker will receive his work from the person behind or beside him.

Heavy equipment should be placed against walls or columns.

Files should be placed against walls or railings.

Desks should face in the same direction for most office operations. Where two employees are working together, they may face each other.

Employees using the same machine should be grouped.

Employees should be placed in front of or around the persons having supervision over them.

Those having frequent callers should be near entrances.

2. Space. Growth of a business sometimes results in installing more desks and other equipment than original plans called for. Overcrowding is bad from the standpoints of appearance and psychological effect of employees, and may overtax existing ventilation facilities.

A suggested minimum width for aisles is 4 ft. For desks facing in the same direction, distance between the back of one desk and the front of another should be not less than 3 ft. More space per employee is highly desirable.

3. Light. Fluorescent lighting fixtures, with high efficiency and low current consumption, are making offices independent of daylight and permitting more efficient use of available space.

If offices depend largely on daylight, employees engaged in the visual tasks should be located near windows. North light is preferred by draftsmen and artists.

Employees should not face windows, unshielded lamps or other sources of glare. Walls and other surfaces should conserve light, while avoiding annoying reflection.

4. Ventilation. Window ventilation is often unsatisfactory. Persons near windows may feel cold; those farther away may be warm. Where there is much interior space, forced ventilation may be needed. Such an installation should be planned and installed by experts. More and more

90% of overhead servicing can be done faster and safer with these ECONOMY Hi-Reach Telescopers!



Model LB HI-Reach Telescopers Four heights 20 ft. to 35 ft. Standard Models from \$1510.00 up.

#### Model PUL Three Standard Models

Custom built Hi-Reach Telescopers up to 100 ft. Write for complete catalogue. Economy Engineering Co., 4518 W. Lake St., Chicago 24, Ill., 342 Madison Ave., New York 17, N.Y.

#### ECONOMY

] EINGINEERING

Circle Item No. 34—Reader Service Card

offices are being air-conditioned, but many will have to get by with natural ventilation for some time.

5. Noise. Sound-absorbing materials for ceilings are desirable, even where normal noise is not considered excessive. Noisy machines should be segregated.

6. Electricity. Dictating machines, electric typewriters, desk lamps, and other equipment require outlets and extension cords, which

should be arranged to avoid tripping hazards.

7. Floor maintenance. Defective tiles or boards should be repaired immediately. Floor finishes should be selected for antislip qualities. Special care is needed on stairways and at elevator entrances.

8. Glass doors should be painted with some conspicuous eye-level design to prevent persons walking into them.

Plan Work Furniture For the Individual

WELL-DESIGNED work furniture permits efficient work without unnecessary fatigue. Work surfaces should be of correct height. Chairs should be adjusted to the needs of the individual.

Alternate periods of sitting and standing at work reduce fatigue. If this is not practicable, furniture should be planned for maximum comfort and efficiency.

Work surfaces. Height of benches, machines, tables, and assembly lines is determined by whether the workers sit or stand. Another factor is whether hands or eyes are more important to the operation.

Tilted or recessed tables facilitate some types of work.

Seating. Height relationship between seat and work is important. Workers differ quite widely in height and proportions and seat height should be adjusted accordingly.

A factory chair should be: Comfortable Safe Easily adjustable Economical to maintain

A chair should provide back support. Without it the worker uses much energy just sitting erect. The back rest supports the back between the lower ribs and the hips.

A deep form-fitting seat, of the tractor, bucket, or western saddle type, is better than the one that is flat or slightly curved. The seat should not touch the tendons and blood vessels on the back of the leg just above the knee.

Too soft a seat is not desirable. Contour is more important than padding.

Edges and corners should be rounded to avoid damage to clothing or injury to persons.

Foot rungs shorter than the foot spread of the chair lessens possibility of tipping, particularly on the higher chairs.

A posture chair must be adjusted to the individual's need, or most of its benefits will be lost. The user should also be taught to sit properly. \* \* \*

Circle Item No. 35-Reader Service Card

### Take the hazard out of Floor Maintenance

WITH HOLT
EXPLOSION
PROOF
COMMANDER

Model EPC16D,
showing handle
in space-saving
stowaway position.

Holt Commander is designed expressly for safe maintenance of floors in oil refineries, atomic research plants, powder factories, and other hazardous industries. There's no outside wiring, Entire unit, from brush to handgrip, is constructed, sealed and safety-tested to prevent sparks and static that might ignite gas, dust, fumes or vapors. Static eliminator wire in brush, a Holt exclusive, even prevents shocks to operator.

With this one machine and Holt Quick-Change Attachments you do a complete floor maintenance job — polish, wax, buff, scrub, etc. Dual handles give operator better control; reduce fatigue. Made in 16 and 20" sizes. For full story write now to Dept. W-3

3

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### BABCOCK Industrial Safety Engineered LADDERS

FIRST Choice of Industrials and Contractors. The NEW Safety Step (right) is only one of Babcock's complete line of Industry-tested ladders. Built for a long life of service—BABCOCK quality in every inch.

Write for the Babcock Industrial Ladder Folder, describing other Extension Ladders, Single Ladders and Step Ladders.

BE SURE . BE SAFE . BUY BABCOCK



The W. W. BABCOCK CO., INC

Circle Item No. 36-Reader Service Card

#### INDUSTRIAL HEALTH ENGINEERING

#### IN SECTION 3

999999

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HEALTH MENACES have existed in many occupations from the earliest times. Early medical literature contains many references to occupational diseases with picturesque names which were generally accepted as an inevitable part of the job. But as industry grew and the number of harmful exposures increased, simple environmental cleanliness proved to be an inadequate defense. Extension of compensation laws to include an increasing number of occupational diseases stimulated research in hygiene of the workplace.

Exposures to be controlled include dusts, gases, vapors, and other air contaminants; extremes of temperature, radiant energy, and noise.

The industrial hygienist, the physician, and the safety engineer have a common interest in personal services, such as sanitary facilities, food service, and drinking water, which have an important bearing on employee welfare.

#### Washrooms and Lockers

Their part in "good working conditions"

FACILITIES for personal cleanliness and hygiene form a conspicuous part of the modern industrial scene. Clean, well-equipped washrooms, toilets, and lockers, as found in up-to-date plants, attract desirable workers and help to keep them healthy and happy on the job.

Attention to these requirements when a building is being planned will insure sufficient space and convenient locations, both for the users and for plumbing connections. Later it may be necessary to fit facilities into less satisfactory space and at

higher cost.

But installations which were adequate when the plant was built may not be satisfactory a few years later. Plant growth and deterioration or obsolescence of equipment may change the picture. A survey will show what changes are needed to bring the facilities up to modern standards.

Location. Good planning minimizes loss of employee time between job and washroom.

Lockers, toilets, and lavatories may be in one central location or scattered through the plant, depending on its size, layout of departments, and type of operations.

In smaller plants, washrooms and lockers are usually near the entrance.

Toilets and lavatories should be not more than 200 ft. away from any work place. In multi-story buildings, one on each floor is desirable. If that is not practicable. they should not be more than one floor above or below the work place.

Washrooms in large one-story buildings usually are scattered throughout the building. Where there are many small isolated buildings, as in chemical plants and railroad yards, or where much of the activity is outdoors, a separate building may house all these facili-

Accommodations should be located so that employees will not have to cross highways or railroad tracks to reach them.

When lockers and washrooms of

a large plant are near the main entrance, lavatories and toilets are often scattered through the plant. This saves workers' time and makes it possible to close the main room during working hours, lessening danger of theft and need for close supervision.

Separate washrooms and lockers are desirable for departments with exposure to excessive dust, dirt, heat, vapors, or moisture. These need additional lavatories or shower

Offsetting the advantages of scattered facilities is the higher cost of installation and maintenance. Central toilet and washing facilities are often preferred where women are employed. In some plants a fulltime attendant may be needed.

Large plants with underground passageways connecting buildings and departments often locate personal service facilities along these corridors, conserving space for manufacturing operations. Another space-saving method is to locate facilities on balconies.

Light. Fixtures should provide sufficient light in all parts of the

room. Walls, ceilings, and partitions in white or light colors conserve light and encourage cleanliness.

Ventilation. Unless the washroom has sufficient outside windows for natural ventilation, forced ventilation will be needed.

Floors, and walls to a height of at least 6 in., should be of impervious material, such as glazed tile or concrete with good friction characteristics.

Walls should form a tight joint at the floor level, or there should be a cove base at least 6 in. high. Walls should be impervious to water to a height of at least 5 ft. Wall and ceiling surfaces should be washable.

#### **Wash Fixtures**

Group washing equipment. In industrial plants, institutions, schools, and other establishments where facilities must be provided for large groups, circular wash fountains are the most frequent choice.

Eight to 10 users can be accommodated at a 54-in. circular fountain and 5 to 6 at a 36-in. unit. Fewer valves and plumbing connections cut installation and maintenance costs.

Economy of water is another advantage. Several persons at a cir-



SPIC AND SPAN washrooms are characteristic of the modern plant. Wash fountains with soap and towel dispensers promote personal cleanliness. Tile walls, concrete floors, and lockers on cove bases facilitate maintenance.

cular fountain use little more water than one at an individual basin. Each user washes in clean running water of regulated temperature. A foot or hand-controlled mechanism regulates the flow.

Semi-circular units 36 or 54 in. wide mounted against a wall are used for narrow or irregular wash-

Precast stone and marble are the most frequently used materials. Some models are also available in enameled iron and stainless steel.

Individual basins of vitreous china or enameled iron are satisfactory for comparatively small groups.

Mixing faucets are better than separate faucets for hot and cold water. Hot and cold handles should be plainly marked, with the hot water valve always on the left side. Thermostatic control of water temperature is desirable.

Faucets should permit washing in running water. Avoid stoppers.

Enameled troughs may be used where first cost is a consideration. Over these are hot and cold water pipes with mixing faucets spaced

#### References-Personal Hygiene, Skin Diseases

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DISPENSERS for waterless skin cleanser and paper towels in aircraft manufacturing

not less than 24 in. apart. Doublewidth troughs, or single-width troughs back to back, save space.

Spray heads at basins or troughs should be high enough to permit washing head, arms, and shoulders under the spray.

Showers are needed in many industries, particularly where operations are hot or dirty, or where toxic materials are used. Requirements depend upon nature of the processes. They range from 1 shower for every 5 men to 1 for every 15.

Shower installations may be of the compartment or the circular multi-stall type.

Floors and approaches should be of slip-resistant materials, such as concrete with an abrasive surface. A curb 4 in. high should be erected around shower stalls, to keep water within the enclosure. With adequate slope to the drain a curb may not be necessary.

Painting the curb a contrasting color helps to prevent tripping.

Emergency showers. Quick-acting showers should be installed at convenient locations where caustics. acids, and other corrosives are handled

Eye fountains are also desirable where chemicals are handled. Prompt flushing of the eyes is recognized as the best first-aid treatment for any chemical in the eyes.

Fungus infections. Warmth and moisture in shower rooms are conducive to the spread of fungi that cause "athlete's foot." Floors and stalls should be scrubbed daily with detergent and water as a general sanitation measure. A germicide in the scrub water is an added precaution.

Careful drying of the feet and use of an antiseptic foot powder help to prevent infection. Preparations for toughening the skin increase resistance to fungi.

Pans of antiseptic solution have been found ineffective or worse.

Disposable paper slippers or wooden clogs keep the feet from contact with the floor. They need not be worn in the stall where the floor area is kept mechanically clean by the flow of water.

#### Skin Cleaners

Four types of skin cleansers are in use: (1) Soaps (2) Sulfonated oils (3) Synthetic detergents and (4) Waterless cleansers.

Soaps. Powdered soaps consist principally of powdered hard soap and water softener, to which a scrubbing agent may be added. Cornmeal, a commonly used scrubber, may be coarse or fine. Most soaps can be used with hard water.

Organic solvents, such as naphtha, turpentine, and carbon tetrachloride, should be avoided. Some, particularly carbon tet, are toxic, some are flammable, and all have a drastic defatting action. If they must be used to remove substances like lacquer that resist ordinary cleansers, emollient creams help to offset loss of natural skin oils.

There is less waste with powdered soap than with cake soap.

Liquid soaps are generally satisfactory where a scrubber is not desired. They are frequently used in office washrooms and in first-aid rooms.

With either powdered or liquid soap in suitable dispensers it is easier to keep fixtures clean than with cake soap.

Soap should contain no free alkali and should show a low pH in dilute solution. This can be determined before purchasing.

Sulfonated oils are useful for dry and soap-sensitive skins. They are -To page 70

#### **Industrial Ventilation**

Providing clean air for the workplace



**DUST CONTROL** system for removal of asbestos fiber from one milled in the building. Capacity is 2,500,000 cfm. Area of cloth bags in filter system is about 30 acres, with four miles of ducts and 4,000 dust enclosures. (Johns-Manville Corp.)

CLEAN AIR is necessary for the health and comfort of those who occupy any enclosed space. For some occupancies, open windows may be adequate. For others elaborate exhaust systems may be needed to remove contaminants from the workroom air. Ventilation also includes control of heat and humidity.

Maintaining air hygiene requirements may be complicated by the generation of toxic or nuisance air contaminants in industrial processes.

Air pollution has become a problem for whole areas as well as for individual plants. In some regions, particularly those which are built up and where the topography does not permit the quick dissipation of contaminated air, gases, dusts, and combustion by-products must be treated to make them safe and unobjectionable before venting to the outside.

Natural ventilation—air circulation through openings in walls unassisted by mechanical equipment —is satisfactory only when the building layout permits free circulation of air and where plant processes do not generate objectionable air contaminants.

**Principles of ventilation.** Ventilating systems are based on either of two general principles, or a combination of the two:

1. Plenum ventilation. Air is driven into the room by fans, diluting the room air with fresh air, forcing out stale air through doors, windows, and cracks. This method is limited to buildings where contaminants are non-toxic and limited in quantity.

2. Exhaust (vacuum) systems. Air is drawn from a room by fans and is replaced by air entering through doors, windows, and other openings.

#### **General Ventilation**

Where processes are not injurious to health, general ventilation is usually satisfactory. It is also satisfactory where dilution of air contaminants will keep the concentration below permissible limits for continuous exposure. Standards for many contaminants have been compiled

by the American Standards Association.

Where contaminants are toxic, removal at their source is necessary.

Ventilation is often complicated by the necessity of maintaining a comfortable temperature. Exhausting impure air is usually practicable but in cold weather it may be difficult and expensive to warm large volumes of incoming air.

Natural ventilation is adequate for some buildings housing non-hazardous operations. Air circulation is aided by doors, windows, roof ventilators, and monitors. The number of outlets should be planned for hot weather when the temperature difference inducing the draft is at the lowest point.

Air intakes should be located so that incoming air is properly tempered and does not cause uncomfortable drafts in cold weather.

Artificial general ventilation requires properly located inlets and outlets. Air coming into the room must be uncontaminated and discharge points should be located to avoid recirculation.

Contaminant heavier than air can be removed most effectively through openings at floor level.

Fans and blowers. Both portable and stationary types are useful for increasing circulation of air which affords relief from heat. They are not substitutes for exhaust ventilation where air contaminants must be removed.

For moving large volumes of air, blowing is more efficient than suction.

Devices for air circulation become less effective as temperature and humidity rise.

Caution should be used in air movement, particularly with velocities over 200 fpm. When relatively cool air is blown over workers at high velocity, objectionable drafts are created.

#### **Control Measures**

Where there is a definite source of air contamination, general ventilation alone is seldom sufficient. Control involves three steps:

Identifying the substance and locating its source.

- 2. Atmospheric sampling to determine nature and extent of contamination.
- 3. Engineering control measures. Control at the source may involve one or more of these measures:
  - 1. Isolation or enclosure of the hazardous operation.
  - 2. Local exhaust ventilation.
  - 3. Operational changes; substitution of process or materials.

Isolation confines the operation to a definite location. Exposure is either eliminated or restricted to a few selected, trained, and equipped

Installations which combine exhaust ventilation with isolation and enclosure include: sandblasting rooms, shakeout and tumbling-barrel operations in foundries, dry mixing, and mixing of volatile liq-

Processes creating excessive heat, humidity, or noise should also be isolated wherever possible.

#### **Local Exhaust Systems**

Local exhaust systems are an important means of occupational disease control. Their purpose is to create a sufficient movement of air to withdraw contaminants at point of origin and convey them to a safe point for disposal.

An exhaust system consists of four major parts:

- 1. Hoods or enclosures near source of contaminant.
- Piping to connect hoods into system.
- 3. Collection equipment.
- 4. Fan.

Dust is usually more difficult to control than gases, vapors, mists, and fumes. Dusty operations tend to project particles so that the hood must provide velocities sufficient to draw them into the exhaust system.

Exhaust hoods should enclose the process as completely as possible or the hood should be located to take advantage of the directional effects of the dust flow.

Dust-removal systems generally require higher air velocities and ducts of heavier gauge metal than those designed for gases.

Each part has its independent function but all must be designed to work together efficiently.

The exhaust hood is the most important part of the system. It should enclose the process as com-

pletely as possible. Air velocity decreases approximately with the square of the distance from the hood opening.

Air velocity for effective control varies with the process and material exhausted. Generally speaking, the better the enclosure and design of the hood, the lower the velocity needed.

Hoods or enclosures may be in the form of booths, canopies, lateral hoods, downdrafts through grill openings below the process, or slottype hoods. The object is to remove the contaminants without drawing it through the breathing zone of the operators and with minimum interference with processing.

Hoods can be made more efficient by addition of flanges.

Ducts connect the hoods to the central fan, distribute the air flow in direct proportion to the requirements of each inlet, and maintain adequate pipe velocity to convey the contaminant to the point of discharge.

-To page 73

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CONDITIONS under control. Heating, ventilating, and air-conditioning in the Reynolds Metals Company's office building, Richmond, Va., is regulated from this central control panel. (Minneapolis-Honeywell.)

#### **Heat and Humidity**

BOTH CLIMATE and manufacturing processes provide complicated and expensive problems for industry. As temperature rises, discomfort increases, productive efficiency drops rapidly, and health may be affected.

Accident rates are also influenced by lack of alertness caused by excessive heat and humidity.

Serious year 'round exposures include steel mills, glass plants, foundries, and boiler rooms. Seasonal heat hazards (cold, too) are found in construction work, public utility, highway and railroad maintenance, and farming.

Above 90 degrees, the body rapidly loses its ability to compensate for atmospheric conditions. The effects of heat are intensified by high humidity and lack of air movement.

Some persons, of course, can stand more heat than others but it is good operating practice and good employee relations to keep the working spaces as cool as possible in summer and to shield workers from heat generating processes.

Air-conditioned comfort is not yet practical for many industries but other measures will often help. Ventilation comes first. Another method often used with flat-roofed buildings is to keep the roof sprayed with water. For operations where there is radiated heat, shields and insulation may be used.

Ventilation. Keeping air in circulation by general mechanical ventilation is helpful, and spot cooling by fans often increases comfort. However, when the wet bulb temperature of the surrounding air is higher than that of the body, blowing air over the worker makes him feel even more uncomfortable.

In industries such as hot mines, glass plants, and steel mills where heat is excessive, it is frequently useless to blow air over workers unless it is cooled and dehumidified.

Radiated heat. In some operations workroom temperatures cannot be kept below recommended limits. Radiation from hot objects presents difficulties in control. Radiated heat can be decreased by shields or insulation where fans would not be effective.

Adequate washroom facilities and plenty of cool, pure drinking water also offset the effects of hot surroundings.

Work clothing. For a hot, humid environment, clothing should be porous, light in weight, and allow air to circulate around the body.

For exposure to local sources of intense heat and infrared and ultraviolet radiation, special protective garments are needed. (See Section 6).

#### **Acute Ailments**

Exposure to extreme heat, especially when accompanied by physical exertion, may result in heat cramps, heat exhaustion, or heat stroke.

Correct first-aid treatment for each type of ailment is important. All cases should receive prompt medical attention.

In general, the same precautions will help to prevent or minimize all types of disability due to heat.

Heat cramps are due to excessive loss of salt and moisture from the body. They come suddenly and may involve skeletal or intestinal muscles. Even if lost body moisture is replaced by drinking plenty of water, loss of salt may cause heat cramps.



SALT TABLETS and cool drinking water help to offset the effects of summer heat and hot processes,

Heat cramps are relieved in a few hours by proper treatment but soreness may persist for several days.

Heat exhaustion is a shock-like state also resulting from loss of salt and fluid. Symptoms are pallor, relatively low temperature, weak pulse, a feeling of restlessness or anxiety, and sometimes unconsciousness. It is much more serious than heat cramps and is occasionally fatal.

A person with either heat cramps or heat exhaustion should be given salted water, if conscious, and put under medical care as quickly as possible.

Heatstroke (or sunstroke) is caused by exposure to an environment in which the body is unable to cool itself sufficiently—not necessarily exposure to the sun. Body temperature rises and the heat-regulating mechanism breaks down.

Symptoms are severe headaches, flushed face, high temperature, visual disturbances, and loss of consciousness. If prompt treatment is available the patient has a good chance of recovery; otherwise death may occur within a few hours. One of the after effects is inability to withstand heat.

Sunburn can be painful and dangerous. In strong sunlight, the head should be covered and exposure of the skin kept at a minimum. Tan should be acquired gradually. Treatment is the same as for any other type of burn.

#### Use of Salt

Maintaining the salt in the body at an adequate level enables men to work at strenuous occupations where temperatures are unavoidably high.

For sedentary workers, normal use of salt with food may be sufficient. However, those whose jobs require greater physical exertion may not consume enough by this method.

Dispensing. The most convenient and popular method for providing salt is in tablet form. The 10-grain size is more frequently used. Five types of salt tablets are available:

1. Plain.

2. Enteric coated. These pass through the stomach intact and dissolve in the intestines. They can be used by persons with sensitive stomachs.

 Impregnated. A network of inert material within the tablet prevents nausea by slowing down dissolution.

identified by the blue band

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- Health
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- in tanks, tank cars, drums, etc.
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- 4. Combination. Contains 70% salt and 30% dextrose.
- 5. Enteric coated combination. Enteric coating over 30% dextrose tablets.

In plants where supplemental salt intake is indicated, a dispenser for salt tablets may be placed beside the drinking fountain. Dispensers are made in several styles and sizes.

Caution. Persons with kidney or heart disease or high blood pressure should not use salt without medical approval, and should not be placed on jobs where they would be exposed to high temperatures or heavy manual work. **Diabetics** should be warned against tablets containing dextrose and plain tablets should be provided for them.

Water is as important as salt. A full glass of water (8 oz.) should be taken with each tablet.

Salt is sometimes added to the water where drinking water is not used in the industrial processes. Salt tablets may be provided in convenient pocket package for those whose work takes them away from the plant.

Salted drinking water should be used only under medical supervision.\*\*\* of sediment but it will not destroy harmful bacteria.

Temperature of water. For workers who perform heavy manual labor, from 50 to 55F, is recommended. For office workers, restaurant patrons and others who are less active, the temperature may be as low as 45 degrees.

#### **Methods of Dispensing**

Accepted methods of dispensing drinking water are:

- Disposable paper cups provided at outlet.
- 2. Fountains of approved design.

Paper cups should be kept in dust-proof containers and receptacles provided for used cups. Containers must be kept filled or workers will salvage old cups.

**Drinking fountains** should conform to specifications of the ASA Code Z4.2. Important features are:

 An angle jet, which prevents the water falling back on the nozzle.
 A guard to keep the user's lips away from it.

Older installations in factories, offices, stores, and public buildings which do not conform to hygienic standards can often be modernized at reasonable cost.

Line strainers and pressure regulators are desirable accessories for drinking fountains. An outlet for filling glasses is also useful, particularly for office use.

Each cooler may be a unit in itself or a central compressor may serve several outlets.

Hazardous locations. For use where flammable gases, vapors, and dusts may be found, explosion-proof fountains are available.

Maintenance. Regular cleaning of porcelain and metal keeps fixtures attractive and sanitary.

A cuspidor or sand urn should be provided at each fountain to receive trash such as discarded chewing gum and cigaret butts.

Salt tablets. A dispenser should be located at each drinking fountain.

#### **Drinking Water**

WATER constitutes a large part of the human body. Through elimination, perspiration, and breathing, this level is continually being depleted. It must be replenished frequently to maintain health, comfort, and efficiency. While the intake will be higher in hot weather, it is important throughout the year.

Water must be cool and palatable. Facilities should be located conveniently.

Clean, attractive fixtures are also important, particularly for women employees and for the public.

In planning installations these factors should be considered:

- 1. Number of persons to be served.
- Type of work—light or strenuous.
- 3. Temperature of surroundings.
- 4. Purity of water.
- 5. Temperature of water.
- 6. Design of fixtures.
- 7. Location of outlets.

Requirements. One outlet for every 50 persons is a recommended minimum for industrial establishments. More will be needed where temperatures are high or work involves considerable exertion.

It should not be necessary to walk more than 50 ft. for a drink. If outlets are too far apart, employees will not drink enough, or they will spend too much time away from work.

All rooms assigned for eating purposes should have a supply of drinking water. No drinking facilities should be installed in toilet rooms. Safe water supply. Health departments maintain a close watch over municipal water supplies. But when the plant is located outside the city limits, and for temporary operations such as construction, public utility, and oil field work, the employer must supervise the water supply. It should be analyzed regularly.

If unapproved or "service" water is used for industrial processes or for fire protection, signs should be posted warning against its use for drinking. Care must be taken to avoid possibility of cross connections between the two systems.

Sterilization. Water of questionable purity can be made safe for drinking by chlorination or boiling. Compounds for sterilizing water, some in convenient tablet form, are available.

Filtration is desirable for removal



#### **Isolated Jobs**

For jobs remote from city water mains such as construction work, public utilities and railroad maintenance, mining, and other isolated working places, there are safe and convenient methods of providing drinking water. It is not necessary to depend on an open bucket with one cup for the whole crew.

Insulated coolers, with dispensers for paper cups are frequently used. The container should have a tightfitting cover. Ice should not come in contact with the water.

Vacuum bottles for individual use may be provided for remote or hard-to-reach places, such as crane

Purification. If it is necessary to depend on a local water supply of uncertain purity, the water may be made drinkable by tablets available for this purpose.

Salt tablets. In many remote locations, men perform strenuous work under the hot sun and perspire freely. Salt tablets may be issued in individual packages. \* \* \*

portion of the body but most often where oil-soaked clothing rubs the skin. Hands, forearms and wrists are commonly affected.

Men should be encouraged to bathe at the end of the shift. A shower with warm water, mild soap or detergent, and a soft brush is helpful in the control of oil acne.

Predisposing factors. In investigating causes of skin disorders, consider:

1. Degree of perspiration.

**General Precautions** 

- Personal habits of cleanliness.
- 3. Pre-existence of skin disorders and allergic states.
- 4. Diet.

The following are useful in preventing occupational skin diseases:

Maintain good housekeeping around processes.

Provide appropriate personal protective equipment-gloves, aprons, face shields, protective creams, where necessary.

Encourage personal cleanliness to lessen contact of irritants with the

Select a skin cleanser which can be used by most persons. Some sensitive skins may require special cleansers.

This article has been reviewed by Dr. Donald J. Birmingham, Chief Dermatologist, U. S. Public Health Service.

#### **Occupational Skin Diseases**

SKIN DISEASES are a universal problem. Even substances normally harmless will cause irritations of varying severity in some skins. These ailments account for some 60 per cent of all compensation claims for occupational diseases.

While rarely a direct cause of death, these infections cause much discomfort and are often hard to

Causes of occupational skin diseases are classified under five main headings:

1. Mechanical agents-friction, pressure, trauma.

2. Physical agents-heat, cold, radi-

3. Chemical agents-organic and inorganic, subdivided according to their action on the skin as primary irritants and sensitizers.

4. Plant poisons—several hundred plants and woods can cause dermatitis; best known is poison ivy.

5. Biological agents-bacterial, fungus, parasitic.

#### Types of Action

There are two general types of chemical action on the skin:

1. Primary irritation dermatitis. Practically all persons suffer skin irritations from acids, alkalis, irritant gases, and vapors, and from physical agents such as heat, cold, and friction. Brief contact with a concentrated primary irritant or prolonged exposure to a lower concentration results in inflamation.

Allergy is not a factor in these con-

2. Sensitization dermatitis is the result of an allergic reaction to a given substance. Once sensitization develops, even small amounts of the material may cause symptoms.

Some substances can produce both types of dermatitis. Among them are organic solvents, formaldehyde, and chromic acid.

#### **Cutting Fluids**

Cutting fluids are frequently involved in occupational acne. The condition starts with irritation of the skin by continual contact with the oil, forming comedones or blackheads. These comedones later become infected to form oil pimples or boils which resemble adolescent

Careless workers contacting dirty oil is a combination that often results in occupational acne. Some types of skin are more susceptible than others, but anyone will develop oil acne with sufficient exposure.

If precautions are taken, oil acne can be prevented.

Machines and the area around them should be kept clean.

Oil should be changed and the machine thoroughly cleaned after about 120 hours of use. Oil may be reclaimed or replaced, depending on which is cheaper.

Reclaimed oil may be sterilized by heat during the process. Caution should be used in adding germicides. Most of them are irritants if permitted to become concentrated.

Oil dermatitis may occur on any

#### Safety with Solvents

ORGANIC SOLVENTS of many types are used in vast quantities in modern industrial processes and for cleaning. The number of solvents now on the market is enormous and new ones are being developed. Practically all of them are flammable or toxic, or both.

The problem is to select the solvent that will do the job with the least hazard to personnel and property and surround its use with all possible safeguards.

Safety measures include ventilation, personal protective equipment, facilities for personal cleanliness, and medical supervision.

Solvents are used in various manufacturing processes to dissolve pigments, glues, plastics, and other materials. Another widespread use

#### Section 3-Industrial Health Engineering

is to dissolve soil in cleaning equip-

Animal and vegetable fats are readily dissolved by alkalis which combine with the fats to form soap, which is washed away with water.

Soil often combines dust, tars, and gums which are most easily dissolved by organic solvents.

Emulsion cleaners have to be used with water, which limits their use. Straight solvents are needed where water cannot be used, as on electrical equipment.

Organic solvents are those which contain the element carbon, and no metallic or basic element. They are classified in four main groups:

- 1. Hydrocarbons.
- 2. Alcohols.
- 3. Esters and ketones.
- 4. Chlorinated solvents.

In addition to solvent power, other properties may be important to the user. Flash point, toxicity, speed of evaporation, and cost must also be considered.

Properties of solvents. From the standpoint of safety the two most important properties are the flash point and the maximum allowable concentration.

The flash point of a volatile liquid is the ignition temperature of its saturated vapor. Expressed more simply, it is the temperature to which any material must be heated before it will give off sufficient vapor to form an explosive mixture with

Flash points given in most tables are determined by the closed cup method. These are always lower than those determined in an open

Toxicity is measured by maximum allowable concentration (MAC) in parts per million (ppm) of solvent that can contaminate the air in a room for extended periods without endangering the occupants. Solvents with higher MAC have lower toxicity.

Speed of evaporation is also an important factor in toxicity. In addition to the rated MAC, the time it takes to reach that concentration must also be considered. A solvent of low volatility is generally less hazardous than one of high volatility with the same MAC.

Many excellent solvents are not safe for general use. Carbon tetra-



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SAFEI

Fast drying

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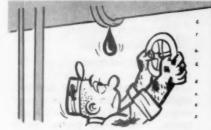
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#### QUICKLY CLEANSES THE SKIN OF



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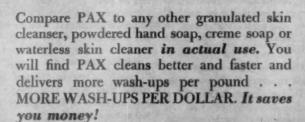
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you are now using sift or drip on to the wash basin? If it does, get rid of the trouble! Order PAX FP-2H dispensers for granulated and powdered skin cleansers or the PAX C-P for either CREMES, PASTES or POWDERED products. Dependable PAX DISPENSERS stop waste save money!

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National Safety News, March, 1959

Circle Item No. 40—Reader Service Card

chloride, for example, is nonflammable but its fumes are highly poisonous. Benzol is too toxic and too flammable for general use.

This discussion is concerned chiefly with liquids used for dissolving grime and grease, rather than those used in complicated chemical processes. For cleaning, a wide range of petroleum hydrocarbons is available. Some are marketed under trade names or numbers. They are relatively nontoxic, with MAC around 500 and flashpoints up to 150 F. Best known of these are the Stoddard solvents with flashpoints of 100-120 F.

It should be assumed that all organic solvents are toxic. If used in any quantities, ventilation determined by an engineer must be provided.

Since solvents dissolve fats and oils, they naturally defat the skin. Workers in these processes should be provided with protective gloves or creams.

Manufacturers of solvents are glad to give the flashpoints and MAC's of their products, also advice on selecting a solvent for the job and suggestions for its safe use.

#### **Food Service**

IN-PLANT FEEDING is firmly established in industry. More than half of the manufacturing plants in the U. S. A. now serve food, and that includes practically all of the large- and medium-sized establishments.

Service ranges from vending machines dispensing hot coffee, soft drinks, and milk to cafeterias serving complete meals. Table service has become rare in industrial restaurants.

Plants with fewer than 250 employees represent nearly 96 per cent of the country's manufacturing establishments. Vending machines and disposable paper utensils have made it possible for many small concerns to provide food service.

Many companies set up lunchrooms and cafeterias because nearby restaurants are unable to handle peak crowds during the lunch hour and much time would be lost going to and from the job.

#### **Types of Service**

There are five main types of food service for industry:

- Cafeterias preparing and serving hot meals.
- Canteens or lunchrooms dispensing sandwiches and other packaged goods and hot and cold beverages. A few hot foods may be served.
- Mobile canteens which circulate through the plant. Hot and cold foods and beverages are carried in vacuum containers.
- 4. Box lunch service.
- 5. Vending machines.

Vending machines now dispense anything that can be packaged soup, stew, chili, french fried potatoes, sandwiches, pastry, fresh fruit, and hot and cold beverages.

The increasing popularity of vending machines is due largely to improved design. Modern machines are more efficient in keeping foods hot and compact refrigeration units have been developed to chill foods. Disposable containers and electronic cooking on the spot have also expanded automatic service.

Vending machines are serviced

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#### DISPOSABLE DISPENSERS THAT MAKE IT EASY TO CHECK SALT SUPPLIES



Can you glance at your present dispensers and tell how many salt tablets remain? Or does a maintenance man pry off the tops of dispensers to find out where refills are needed? Or, do dispensers sometimes sit empty because no one reports the situation?

If you have any of these problems—or want to avoid them—write for more information on StaSafe "Crystal" dispensers. When you are equipped with "Crystals", a brisk walk through the plant will tell you precisely what the salt situation is.

Then, to replenish supplies, just remove the empty dispensers—throw them away—and slide new dispensers in place. Yes, with "Crystals" all tablets are sealed in at our factory to insure cleanliness. There's never any handling of loose tablets and you are actually dollars ahead by discarding the empties.

"Crystals" come in 500 and 1000 tablet sizes with your choice of enteric coated or impregnated tablets at the same price.

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604 BROADWAY NEWARK 4, N.J.

12921 W. WASHINGTON BLVD. LOS ANGELES 66, CALIF. 855 EAST 152nd STREET CLEVELAND 10, OHIO by the companies installing them, relieving the employer of the responsibility of operation.

Few companies expect to make a profit from the service. The usual arrangement is to receive a percentage of the gross receipts which is turned over to employee recreation and benefit funds.

Disposable paper utensils for frozen or for hot foods have simplified food service. They eliminate dishwashing and breakage and make it possible to operate with a smaller staff.

Foam plastic cups provide insulation from hot beverages. Being seamless, the hazard of a scalded hand when a seam fails is eliminated. The foam plastic has no "paper taste."

Some plastic lined paper cups are dangerous. Several have been known to burst into flame if even a lighted cigarette is touched to them. The plastic coating used sometimes has a higher flash point than the paper itself.

Management. Many companies



VACUUM CONTAINERS make it possible to serve hot foods prepared in a central kitchen at distant locations. (Vacuum Can Co.)

have turned cafeteria and canteen operation over to caterers. Some large companies, however, do not like the idea of assigning management of the service to outsiders. If employees do not like the food or the prices, the company, not the caterer, gets the blame. So they provide professionally managed plant cafeterias supervised by the personnel manager.

The contractor gets a guaranteed minimum, any operating loss being assumed by the management. A deficit is regarded as an investment in employee good will.

Smaller companies usually hire an industrial caterer. Foods are prepared in a central kitchen and transported to the plant. This avoids investment in kitchen space and equipment and maintaining the necessary staff. The employer provides the eating space and dishwashing facilities. Dishwashing is kept at a minimum by disposable facilities.

Vacuum insulated containers make it possible to carry hot foods prepared in a central kitchen to lunchrooms some distance away. This equipment is used by some large plants with scattered lunchrooms as well as by caterers.

Sanitation. Wherever food is prepared or eaten, constant vigilance

for *instant*protection from
serious injury
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safety
fixtures



lifesaver emergency showers (patent pending)

Heavy, drenching shower douses flames, washes off acids, chemicals. For indoors and outdoors.



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Speakman Safety Fixtures are furnished in many types and sizes and combinations. Complete descriptions in Safety Booklet S-88-B. Write to Dept. 12-12 for your copy.

SPEAKMAN COMPANY

WILMINGTON 99, DELAWARE

Circle Item No. 42-Reader Service Card

#### **POWERFUL NEW PLUNGER CLEARS**

#### **CLOGGED TOILETS**

in a jiffy!



· Double-size cup, double-pressure

Tapered tail gives air-tight fit

Designed to flex at any angle

Centers itself, can't skid around

Clear messy, stuffed toilets Cut maintenance costs with

#### **TOILAFLEX**

Toilet MIL-MIELE Plunger

Ordinary plungers don't seat properly. They permit compressed air and water to splash back. Thus you not only have a mess, but you lose the very pressure you need to clear the obstruction.

obstruction.
With "TOILAFLEX", expressly designed for toilets, no air or water can escape. The full pressure plows through the clogging mass and swishes it down. Can't miss!

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\$265

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- FREE FOLDER: Facts on Athlete's Foot including medical opinions from \*Archives of Dermatology and Syphilology.

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Circle Item No. 43—Reader Service Card

is necessary to maintain clean, sanitary conditions.

Dishes, if possible, should be washed by machines which can use stronger detergents and hotter water than hands can stand.

Facilities for the disposal of garbage, waste paper, and bottles should be provided.

Workers who bring lunches from home and those who patronize box lunch services may eat in locker rooms, if clean and well ventilated, or in work areas where processes would not make it undesirable or dangerous.

The coffee break has become an established institution. Passes of 10 to 15 minutes in the morning and afternoon for coffee, milk, or a soft drink help prevent fatigue. \* \* \*

#### Washrooms

-From page 59

frequently used where workers are exposed to the defatting action of petroleum oils and organic solvents.

Synthetic detergents of several types, mild but effective, are particularly useful for removing oil, wax and tar.

Waterless skin cleaners are effective in removing grease and grime and newer types can be tolerated by most skins. The earliest waterless cleanser in general use was kerosene—alone or emulsified with ammonia soaps. Subsequently odorless spirits and alkanolomines were used and now there is a variety of materials for the purpose.

Requirements include: Safety to hands; effectiveness; absence of disagreeable odor; pleasant appearance and after-feel; suitable consistency for dispensing; rapid break when

#### WASHING FACILITIES

WASHING FAC				
No. persons	No. washing facilities			
15	1			
30	2			
50	3			
Each additional				
25 persons	1			
With circular fountain outside rim equals I la	ns, 17 in. of vatory.			
(ASA	Code Z4.1-1955)			

on the hands; and stability to heat, cold, and storage.

Portable dispensers with receptacles for waste towels can be set up quickly. No plumbing connection is needed. Dispensers for paper towels can be attached.

Waterless cleansers are not substitutes for soap and water but they are convenient and efficient for specific uses.

Germicidal cleansers. Ordinary soaps and synthetic detergents remove transient bacteria from the surface but do not reach those embedded in the skin. Many germicides, such as phenol compounds, have been tested as ingredients of skin cleansers, but required concentrations that made them unsuitable for daily use.

Hexachlorophene, described by various trade names, has received wide medical approval. It is now used in soaps and detergents for medical, surgical, and deodorant purposes and for general industrial and home use.

#### Drying the Skin

Paper towels meet sanitary requirements and are economical and convenient. Dispensers should be kept filled and receptacles for used towels provided.

Recessed waste receptacles take one more object off the floor, improving the appearance of the washroom and making cleaning easier.

Mechanical hot air driers are acceptable from the hygienic standpoint. Popular types are foot-operated and may be of the pedestal type or recessed into the wall. Equipment should be well grounded and the electrical connection permanently installed without extension cords or plugs.

#### TOILET FACILITIES

lo. toilet bowls
1
2
3
4
5
I for

Towel services are used by some establishments, usually stores and offices. For industrial use, individual towels kept in lockers may not be changed often enough and they may come in contact with soiled work clothes.

#### **Toilets**

Toilets should be partitioned off from washrooms and lockers. Partitions of enameled metal are attractive in appearance and easy to keep clean. Partitions suspended from the ceiling or wall-mounted make floor cleaning easier and quicker.

The oval-rim type of toilet with open-front plastic seat is most widely used. Foot-operated flush valves are favored by many.

The flushing mechanism should be rugged since employees often kick the handle instead of operating it by hand. Flush valves should be equipped with vacuum breakers to



avoid back siphonage.

Toilets should be not more than 200 ft. from any work place; preferably less than 150 ft.

Facilities for men and women should be plainly marked.

Urinals should be placed in convenient locations to avoid loss of time. One urinal for each 40 men is usually sufficient. Automatic flush valves use more water but are more effective in maintaining clean-

liness since many persons seem reluctant to touch hand-operated valves.

Floors of toilet rooms should be of impervious materials, smooth and free from cracks. Tile and concrete are satisfactory. Floor drains permit frequent flushing.

Toilet rooms should have outside windows for light and ventilation if practicable. State or municipal regulations usually contain provisions for ventilation.

Switches for lights, electric driers

or other equipment should be located so they cannot be operated by a person in contact with piping or other grounded conductor. Pull chains should contain an insulating link close to the fixture.

Cuspidors or sand urns should be provided where needed and cleaned at least daily. The disposable type requires less handling.

#### Now No. 46 Bonder Combre Cond

Circle Item No. 45-Reader Service Card

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The Lightfoot Company, Inc., is interested in your skin cleansing problems, and is in a position to help solve them.

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Circle Item No. 46-Reader Service Card

#### Lockers

A well-equipped locker room is an aid to orderly habits and occupational hygiene.

Locker rooms should be fire-resistant, separated by fire walls from the main building.

Exposure to toxic substances calls for extra precautions to prevent contaminated clothing leaving the plant. Separate lockers prevent contact between street and work clothes. They should preferably be in separate rooms with shower stalls between them.

Supervised washup periods and shower baths are needed wherever poisons are handled.

Sloping tops on lockers prevent use for storage. Dust is conspicuous and easier to remove than with flat tops.

Built-in lockers extending to the ceiling avoid dust-catching surfaces.

Lockers should be at least 4 in. off the floor to permit flushing the floor without wetting the contents of the lockers.

Forced ventilation, through perforations in the bottom of the lockers or through louvers in the doors, helps to remove odors. If the work is heavy or wet, circulation of heated air through the lockers is desirable.

Oil-soaked clothing, waste, or newspapers kept in lockers may create a serious fire hazard. Lockers should have solid fire-resisting sides and backs, but doors should have louvers for ventilation. Employees should not be permitted to leave clothing or rags saturated with oil or paint in lockers.

#### SPACE FOR TOILET FACILITIES

Minimum floor space—sa. ft.

**	summing from observe adv his	
Closets	***************************************	16
		12
Urinals	***************************************	12

Baskets and hangers on elevating chains are used instead of lockers in some industries, such as mines and foundries. Damp work clothing can be dried between shifts and drying can be hastened by steam coils at the ceiling. This arrangement conserves floor space.

#### **Rest Rooms**

A rest room should be provided where 10 or more women are employed. Where there are fewer women and a separate room is not available, suitable space may be screened off.

For 10 women, minimum space is 60 sq. ft., with at least 2 sq. ft. for each additional woman employed.

For less than 100 women, at least 1 bed or couch should be provided. For 100 to 200 workers, 2 beds, and 1 bed for each additional 250 workers. \* \* \*

#### Ventilation

-From page 61

The system should be balanced so that each hood draws the proper amount of air. When this condition has been obtained, all means of adjustment should be permanently fixed. Areas of branch pipes and main ducts can be calculated to give correct air velocities throughout the system.

Material used for ducts must resist abrasive action of dust or corrosive effects of gases and vapors.

Sharp turns in ducts take extra power and cause a large pressure drop.

Traps with clean-out gates should be provided at the bottom of vertical runs, and clean-out gates at regular intervals on the bottom side of horizontal runs.

Fans should have a capacity slightly higher than calculated requirements to allow for leakage in the system, accumulation of material on fan blades, and similar difficulties.

Where the contaminant is hot and has a natural tendency to rise and the operation can be provided with an effective enclosure type hood, natural draft ventilation is often satisfactory. Portable ventilators are used for supplying fresh air to confined spaces for temporary work. Examples are tanks, tank cars, vats, underground cable manholes, pipe galleries, ship holds, and airplane wing compartments and fuselages.

Where objectionable fumes are produced, as in welding under some conditions, ventilators exhaust contaminated air.

#### **Disposal of Contaminants**

Equally as important as collecting the air contaminants is its dis-

posal. Gases, vapors, and mists, may often be discharged to the outside atmosphere at a point where they will not recirculate around the premises in harmful concentrations.

Dusts, both harmful and nuisance, require the use of dust collectors in the system.

Recirculation of air is generally undesirable, particularly when the air has contained gas or fumes. Where only nuisance dusts are involved, recirculation after cleaning is often permissible.





Leading industrial doctors advise immediate washing with plenty of ruming water as the best first aid treatment for any chemical in the eyes. Records prove that washing with water for ten minutes or more, close to the accident, is necessary to reduce or eliminate eye damage.

eye damage.

Forehead operation leaves hands free to open eyelids so water can be directed wherever chemicals might be lodged. Sanitary white baked ename bowl is resistant to most tunes.

Over 500 industrial plant installations have been code to date.

been made to date.

Write For Details.





#### BENSON & ASSOCIATES.INC

P. O. Box 7542, Dept. N.S., Chicage 80, Ill. Circle Item No. 48—Reader Service Card Recirculation is not desirable when handling dusts containing such substances as lead, silica, and asbestos.

Air coming from the cleaning device must fall within the permissible range for toxic or flammable dusts.

#### **Dust Collectors**

Methods of removing dust from the air exhausted by the system include:

- 1. Filtration.
- 2. Electrostatic precipitation.
- 3. Wet collectors.
- 4. Dynamic precipitation.
- 5. Supersonic flocculation.

Filters are porous mediums through which dust-laden air is drawn. Some are designed to collect dust in the form of a layer on the upstream surface. This is characteristic of cloth and paper filters. Thicker types, such as those of metal mesh or glass fiber treated with oil, have greater dust-holding capacity but do not collect the finer particles.

A filter should have:

- 1. Low initial resistance to air flow.
- Reasonable length of service.
   Efficiency under changes of tem-
- perature and humidity.
  4. Low flammability.
- Reasonable replacement cost or ease of cleaning.
- 6. Low maintenance cost.
- 7. Freedom from odors.

Electrostatic precipitation is highly efficient—particularly for fine dusts which are difficult to remove by other methods. It offers low resistance to air flow. First cost and maintenance cost are relatively high.

Portable units are helpful in removing dust and smoke from small rooms.

Precipitators are less effective in collecting large particles moving with considerable force. For high concentrations of dust they generally require pre-cleaners. They are valuable when the process requires a practically dust-free atmosphere.

A combination of viscous filter and electrostatic precipitation with a self-cleaning feature is used on some models. It solves the problem of dust capacity and of heavy particles. Cyclones. A cyclone consists of an outer cylinder fitted with an inverted cone-shaped hopper and an inner concentric cylinder which serves as a discharge duct. Air from the main duct of the exhaust system, under high velocity, enters the large chamber where the air is given a circular motion. The heavier particles are thrown to the outer wall by centrifugal force and fall along the wall. Air escapes through the top.

Cyclones are the most effective for large particles, such as sawdust, shavings, or heavy lint. After passing through them, air cannot be returned to the workroom without further filtering. Cyclones are relatively inefficient for removing small

particles.

Multiple small diameter cyclones of small taper collect finer particles than the common large diameter ones, mostly because of higher velocities and greater, centrifugal force.

Dynamic separators combine fan and collector in one unit. This type of separator is somewhat like a cyclone, but the centrifugal sepa-

# HIGH VOLUME Air Sampler



. . . accurately samples the air for air pollutants, including radioactive particulate matter, dusts, smoke, smog . . detects and measures community and industrial health hazards.

. . . designed for indoor or outdoor testing—accurately samples particulate matter as small as 1/100 of a micron

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V. A.C. outlet.

. . . indispensable for series or unit testing.

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### The **Stuplex** Co. Air Sampler Division

777 Fifth Avenue, Dept. N. Brooklyn 32, N. Y.

Circle Item No. 49—Reader Service Card

rating action is performed by the revolving blades. It is more efficient than the cyclone.

In some types water spray is introduced with the dust at the inlet. Wet collection increases efficiency for fine dusts.

Wet collectors use several devices for obtaining contact of water with the exhausted air so that dust particles form a sludge. One type consists of sprays or water curtains through which dust-laden air is drawn. These are efficient collectors for many types of dust.

An important application is in the prevention of dust explosions from grinding aluminum or magnesium.

Supersonic flocculation. Suspended dust is passed through a field of supersonic vibrations, inaudible to the human ear, generated by a high-frequency siren. Vibration flocculates the fine particles, and the aggregates are then collected by cyclones or other measures for collecting relatively coarse particles.

#### **General Measures**



Circle Item No. 50—Reader Service Card National Safety News, March, 1959

Personal protective equipment is needed where exposure is occasional or where complete protection is not practicable. Removal of the hazard at its source should remain the objective.

Sanitation and maintenance must receive constant attention to keep equipment at top effectiveness and prevent development of unhygienic conditions.

Supervision and training of employees, particularly in hazardous operations, are important.

Medical control is an important check on other methods. Engineering control is sometimes inadequate and symptoms of absorption of toxic materials by a worker may be the first real warning.

The safety department should be notified of the introduction of new materials and processes so possible hazards may be assessed and safeguards provided.

Workers exposed to toxic substances should have frequent physical examinations. \* \* \*

#### Wiping Up Grease

Removing oil and grease from machine tools and dies and other wiping jobs may be done by paper wipers, industrial wiping towels, and waste or salvaged rags.

Either of the first two methods is more likely to promote good house-keeping. Paper wipers are collected and burned at the end of the day, reducing the fire hazard. Convenient receptacles are needed. The paper is highly absorbent and has enough wet strength for use with solvents.

Wiping towels of sturdy cotton cloth are absorbent and offer some protection to the hands where work is done around metal chips and turnings or on rough surfaces. Cloth towels are furnished by industrial laundries.

With salvaged rags and waste, men sometimes keep partly used rags behind benches, in corners and under machines, creating a housekeeping problem and a fire hazard. Safe metal containers should be provided and their use required.

Cleanliness around steam pipes



In hot weather, most people eat less—thus fail to meet the body's minimum vitamin needs, or to replace all salt lost by the system. Now—"Pep-Ups" with BOTH vital elements help your workers maintain full physical efficiency. Hold down the Hot Weather Rise in Accident Rates, with



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Circle Item No. 51-Reader Service Card



• 300 watt DC generator

Propane or Butane fuel Safe fresh air blown into the manhole at all times.

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We are also geared to handle all sorts of specialty items built to customer specifications on quick-delivery schedules.

Circle Item No. 53-Reader Service Card

is particularly important. Accumulations of dust, lint, and other finely divided material that might ignite should be prevented.

#### Controlling Air-Borne Bacteria

Control of air-borne bacteria is required sometimes by manufacturing processes, as well as for health reasons.

Ultraviolet radiation and chemical bactericides will destroy bacteria, but practical methods of application impose numerous difficulties.

Ultraviolet radiation, using lowpressure mercury lamps with ultraviolet transmitting glass or quartz envelopes, will destroy many microorganisms.

Application is by irradiating the upper air stratum of a room, beaming or screening to provide a narrow barrier of protective light, or inserting a radiation source in an air duct.

Radiations of sufficient intensity to kill bacteria are injurious to eyes and skin. Lamps should not be in the range of vision.

Chemical bactericides. Propylene glycol is effective under most conditions. Effective concentrations are odorless and non-toxic to humans.

Their use requires close control of humidity in the area to be protected.

#### Cab Coolers Make Hot Jobs Comfortable

Operators of overhead traveling cranes often are subjected to extreme heat and humidity, as well as to gases, vapors, and dusts from operations below.

Cab coolers designed to improve conditions on such jobs are selfcontained units that need only an electrical connection. They supply clean air, cooled and dehumidified. to the cab.

Locomotive cranes, which often operate in hot locations, can be provided with similar equipment. It can also be used to heat the cab in cold weather.

For pulpits and other control locations in steel mills where heat, dirt, or fumes create uncomfortable and hazardous conditions, similar equipment has been designed.



#### IN SECTION 4:

9999999

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EARS are taking more punishment now, and industry is being handed a large part of the bill.

But compensation payments are only part of the total cost. Increased fatigue and susceptibility to accident are not easy to figure, but they have a definite connection with noisy surroundings. And noise from nearby industries and street and highway traffic depresses property values.

There are two methods of control—engineering and medical. The first deals primarily with the environment; the second with protection and supervision of the employee. Both methods may be needed.

## **Noise Control**

#### **Engineering and medical measures**



TECHNICIAN takes sound pressure level readings at a punch press with an electronic instrument, the Soundscope. (Mine Safety Appliances Co.)

WE LIVE in the midst of sound, most of it, fortunately, pleasant and comforting. A world without the familiar sounds would be appalling. But our world also contains "noise," defined as "unwanted sound." Noise may be objectionable because of intensity, pitch, rhythm, or quality.

Noise may or may not be harmful to hearing, depending on its character and the conditions of exposure. Noise is a problem to industry for four general reasons:

- Some types of noise may injure the hearing of those exposed to it.
- Claims for compensation for loss of hearing attributed to noisy conditions on the job.
- Noise may contribute to accidents by interfering with voice communications or warning signals or through creation of nervous tension and fatigue.
- Effect on public relations through raising the community noise levels and through the plant's reputation as a noisy place to work.

Components of sound are:

- 1. Intensity, or loudness.
- 2. Frequency, or pitch.
- 3. Quality, or timbre.

#### **Measurement of Noise**

1. Intensity, or loudness, is measured by a sound level meter, commonly called a noise meter. It consists of a microphone, an amplifier, a calibrated attenuator, three frequency response networks controlled by three taps, and an indicating meter.

The unit of sound measurement is the "bel," or more commonly, the "decibel" (db.), which is one-tenth of a bel, named in honor of Alexander Graham Bell. A level of zero decibels represents roughly the weakest sound which can be heard by a person with very good hearing.

Noise levels produced by familiar sources of sound are shown in Table I.

2. Frequency and quality. The sound level meter measures only

weighted or unweighted sound pressure. For a more complete description of sound, measurements must involve frequency and quality or timbre.

Different types of noise have different effects on the hearing mechanism. Noise of high intensity is believed to be more injurious to the hearing when it is of high frequency than when the frequency is lower. A locomotive whistle, for example, produces a sound of low frequency, while an air hose produces a sound of high frequency.

Two sounds of identical intensity and pitch may vary appreciably in the annoyance they cause due to differing harmonic make-up or quality.

Information on the distribution of sound pressure as a function of frequency may be obtained through measurements made with a sound level analyzer. Several types of analyzers are available and the choice will depend on the use to which data will be put.

Noise levels above 130 db. may cause permanent damage to normal ears, even after relatively short exposure. This limit represents the pain threshold for many persons.

#### **Critical Levels**

Limits for injurious noise are still vague and uncertain. The whole problem of noise control requires much more research and evaluation.

In determining critical levels actual intensity of sound is not the only factor. The following are also important:

- 1. Frequency or pitch of sound.
- 2. Total length of exposure.
- Length of exposure period.
   Whether sound stimuli are con-
- tinuous or interrupted.
  5. Length of interruptions.
- 6. Type and space of environment, with reference to reverberation.

In addition to these environmental factors, the age of the individual and his record of previous trouble should be considered.

Various plant operations should be tested with an approved sound meter and a record of noise levels compiled by departments. This refers to levels more or less continuously present, not occasional high intensity noise. If a sound level meter is not available, an approximate idea of the noise intensity may be obtained as follows: Walk through the plant with a person having normal hearing and try to carry on a conversation. If shouting is necessary, the sound level is usually higher than 90 db.

#### **Methods of Control**

Methods of noise reduction fall into two classes: (1) Engineering; (2) Medical.

#### I. Engineering Control

Methods for reducing the noise level may be classified as follows:

1. Control at source. The most fundamental attack on noise hazards is removal at the source. With good engineering design much noise can be eliminated. Many industrial machines and home appliances have been greatly quieted by improved design.

Lack of balance in rotating machines can set up vibrations which are magnified by other parts. Resilient materials can be used for parts which are causing noise. Machinery covers can be damped with undercoating material.

#### TEN STEPS TOWARD NOISE CONTROL

- 1. Make a noise level survey.
- Analyze each machine and location; determine source of noise, and keep an accurate decibel count of each machine's noise output.
- Appoint a specialist to study the problem. He should be directly responsible to management.
- 4. Call in outside consultants.
- 5. Check new equipment for quietness in operation.
- 6. Keep old equipment in efficient operating condition.
- 7. Substitute quieter operations where practicable.
- 8. Consider possibility of isolating noisy processes.
- 9. Check locations where sound-absorbing materials might help.
- 10. Use ear protective devices where other methods are not practicable.

Much unnecessary noise results from worn and improperly maintained machines. It is important, therefore, that machines be kept in good operating condition.

2. Substitution. Another method of noise control is to substitute a less noisy operation, if possible. Spot, arc, or flame welding may be substituted for riveting in some operations. Application of this method is limited but it should be considered.

3. Isolation. Frequently noise can

be isolated so its disturbing effect will be encountered by fewer people. A noisy machine may be removed from a room containing many people and placed elsewhere so as to expose only the employees necessary for the job. Isolation, however, does not help the men who must work in these areas. They should be provided with ear protectors.

Well-insulated partitions and tightly-closed doors, preferably of the refrigerator type, should be provided between a noisy room and adjoining areas.

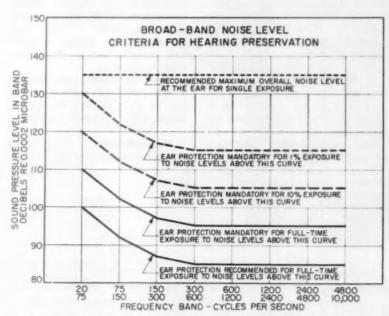
Another aspect of segregation from noise is reducing time of exposure. Noisy processes should be made as automatic as possible, so that workers can retire to a quieter area at frequent intervals. Quiet surroundings should be provided for lunch and rest periods.

4. Reducing vibrations. If heavy machines are firmly bolted to concrete or wood floors, the floor often becomes a huge sounding board. This not only amplifies the original noise volume but helps spread the noise throughout the entire building.

Resilient mountings of various types will usually reduce both the vibration and noise. Resilient floor coverings further reduce the noise level.

Many types of vibration insulators are available commercially. Because each machine is a problem in itself, engineering advice should be obtained.

Sound-absorptive materials are extremely useful for controlling



HOW MUCH NOISE can ears stand? Here are the noise levels at which ear protection is needed for various frequencies and exposures. (Laymon N. Miller in Safety Standards, published by U. S. Department of Labor.)

#### TARLE I Scale of Representative Sounds (Decibels)

Zero Reference	0
Whisper	20
Low Street Noise	40
Conversation	60
Heavy Traffic	80
Critical Level	90
Subway	100
Airplane	120
Jet Engine	140

noise in buildings. Hard surfaces. such as plaster and brick walls, reflect sound and cause reverberation. Sound may come from several directions and travel long distances apparently undiminished.

A remedy is the absorption of high frequency sounds by the application of acoustical materials. Sound absorbents may be applied to ceilings and walls in the form of acoustical tiles, plasters, sprayed-on compositions, and blankets prefabricated from porous material, such as glass wool.

Where structural treatment is not practicable, acoustical baffles suspended from the ceiling bring a substantial reduction in noise levels.

Acoustical treatment does not lessen the direct noise of machines but is highly effective in decreasing indirect or reflected noise.

The problem of sound control by acoustical treatment is far from simple. To get results from the investment the installation should be planned by experts in the field.

6. Protective devices. In some industrial operations the best sound control measures now available still leave the noise level too high for safety. The outstanding example of this situation is in the testing of jet engines.

In such cases operators should be protected with properly designed and fitted ear protectors which will reduce the intensity of the sound reaching the hearing mechanism.

#### **Personal Protection**

Four types of devices for ear protection are available commercially:

1. Molded plugs, or stopples, are made of neoprene, vinyl plastic or rubber and inserted in the ear canal. These are easily cleanable and neoprene and vinyl are resistant to ear wax. Plugs should be smooth, with no abrasive action on the external canal. They should be fitted by a trained technician.

2. Muffs should fit the head snugly and be free of projections which could catch on machinery and structures. They must clean easily and not cause undue pressure or perspiration at contact points.

3. Helmets reduce sound energy transmitted to the bones of the head. The face should be covered for maximum effectiveness. The firm type of helmet, similar to a football or crash helmet, is rather warm, cumbersome, hard to get on and off. Soft cloth helmets containing muffs are more comfortable and provide adequate protection at moderate noise levels.

Combinations of ear plugs and muffs or helmets give more protection than either alone. They are needed for intimate exposure to jet

4. Ear valves. This type of protector is made of non-corrosive metal and neoprene or soft plastic. When placed in the ear canal, the valve admits conversational tones but closes automatically and protects the inner ear from pressure caused by sudden loud noises. Ear valves are more expensive than the simpler ear plugs.

5. Waxed cotton plugs. Balls of wax and cotton are molded by the user to fit his ear canals. This is an effective type of protection for most exposures. These plugs should not be confused with wads of untreated cotton which offer

#### TABLE II Common Industrial Noise Levels (Range in Decibels)

Spinners, looms, lathes	80-	95
presses, riveters, cutoff saws	90-	95
Planers, routers, sheet metal, speed hammers	110-	115

Drop hammers, chipping

hammers -...

little protection when stuffed in the ears.

110-125

Amount of protection. Good devices generally reduce the noise reaching the inner ear by 25 to 35 db., varying somewhat with design.

Individual preferences, as well as ears, differ considerably, so it is advisable to have several types on hand and let the user choose the

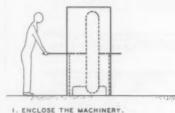
Well-fitted ear plugs provide protection against sound levels up to 130-135 db. under most circumstances, even when exposure is prolonged and continuous.

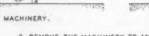
#### II. Medical Control

Where processes are noisy, engineering control methods should be supplemented by medical supervision. A record of each employee's hearing should be kept, with periodic tests to detect possible deterioration.

Many companies now measure a new employee's hearing acuity just as they measure his height, weight, vision, or blood pressure.

The audiometer is the standard device for testing hearing. This in-







2. ENCLOSE THE OPERATOR

3. REMOVE THE MACHINERY TO AN ISOLATED AREA.

THREE METHODS of isolating disturbing noises. Any one or a combination of them will reduce noise levels. (U. S. Gypsum Co.)

## 1 MEDICAL

let IAC help you institute an effective hearing conservation program ...in just 3 steps

IAC Audiometric
Examination Rooms
provide the proper
testing environment
necessary for obtaining
accurate and valid
audiograms in
pre-employment,
periodic and
termination hearing
examinations.



# 2 ENGINEERING

IAC Machinery Enclosures help control noiselevels by isolating noisy equipment. These enclosures protect personnel from damaging noise exposure from equipment such as shredders, dicers, vibrators, swagging machines, etc.



# 3 ENVIRONMENTAL

IAC, leader in industrial noise control, offers you engineered equipment, designed to your specific requirements for effecting a complete Hearing Conservation
Program. Send coupon for complete details.

Valuable Territories Open for Qualified Representatives. Where manufacturing noise cannot be isolated, IAC Quiet Rooms provide controlled working conditions to shield personnel from damaging noise. Typical applications include such uses as shop and power plant offices,

control booths, etc.



Industrial Acoustics Company, Inc. 341 Jackson Avenue — Dept. NS-3 New York 54, N. Y.

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INDUSTRIAL ACOUSTICS
COMPANY, INC.
341 Jackson Avenue • New York 54, N. Y.



Circle Item No. 54-Reader Service Card



AUDIOMETER TEST provides scientific measurement of hearing acuity at various frequencies. The employee is tested in a soundproof booth. As soon as he hears a tone at each of the seven frequency levels he presses a button. (International Business Machines Corp.)

strument produces tones of purity and intensity required. One pure tone at a time is presented by headphone to the person under the test. The weakest intensity which he can hear is then found.

The measure of a person's hearing loss of the difference in deci-

bels between the weakest intensity he can hear and the intensity that can just be heard by a person with normal hearing. Another frequency is then selected and the test repeated.

A graph, known as an audiogram, is then plotted. Hearing loss in decibels is plotted on the vertical ordinate against the log frequency on the horizontal ordinate. This gives a quick, accurate picture of the person's hearing acuity in the audible range.

Audiometer tests may be made by trained non-medical personnel. The hearing program, however, should be supervised by a physi-

Routine audiometer tests made at regular intervals are advisable in addition to the pre-placement tests.

Audiometric readings will determine the effectiveness of protective devices. The audiogram must be performed prior to initial noise exposure and repeated at intervals determined by the findings and the level of the noise exposure.

Careful pre-placement and periodic audiograms will detect progressive hearing loss and thereby assist in revealing the effectiveness of protective devices. Audiograms will reveal whether ear plugs are being worn, even in more moderate noise level areas. The fact that one can determine this from audiograms puts pressure on employees to comply with plant regulations on wearing plugs. \* \* \*

AN AUDIOGRAM (below) is

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to simplify your industrial hearing test program . . .

# check employee hearing faster, more accurately

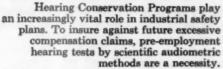
with the

# Beltone

#### PORTABLE AUDIOMETER



Model 9-A, \$295. The most widely used audiometer for industrial hearing conservation programs. Model 9-A is equipped with individually equalized double air receivers, instruction manual, pad of audiogram cards, plastic dust cover.



Experts agree that the Beltone Portable
Audiometer gives industry outstanding
advantages for testing. Leading companies
have turned to the Beltone Portable
Audiometer because it gives them these
unsurpassed features:



- Accuracy exclusive one tube electronic circuit and single induction coil assure greater accuracy through trouble free circuits.
- Ease of Operation —large easy-to-read dials allow operator to prepare audiograms quickly, simply, with minimum amount of effort.
- Weight —only 11 pounds—far less than most previous audiometers.
- Low Cost —no other audiometer costs so surprisingly little to buy, service, and maintain.



Model 10-A, identical to Model 9-A, except that it is equipped with calibrated masking tone and bone conduction receiver. Model 10-A, \$350.

# Beltone

#### AUDIOMETERS

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Circle Item No. 55-Reader Service Card

#### What Type of Noise?

Intensity of noise is only one of the elements involved in planning a noise control program. The type of noise is also important:

- Is it a continuous rumbling of general factory noise? Or are there peaks of loud noise?
- 2. Is noise continuous? Or intermittent?
- 3. Are there sudden impacts that cause the noise?

An acoustical engineer can determine the noise level and type of noise in areas that are considered critical. The engineer must determine whether it is feasible to treat the area acoustically, isolate the process, or treat the machine to decrease noise at its source.

If engineering measures do not solve the problem, personal protection will be needed.

Types of exposure. Three common groups of exposure are:

- 1. Riveting and production (including saws, spindle shapers, etc.). Noise in these areas may be fairly constant, with peaks in the immediate vicinity of the operator. Ear plugs fitted to the individual usually offer adequate protection.
- 2. Hammer shops. Noise for a hammer operator is greatest at the time of impact of the hammer, but with a large battery of these machines, the over-all noise level is rather constant. The old-time operator may consider it a badge of his trade to be somewhat hard of hearing and will resist wearing protective devices.
- 3. Jet engines present the greatest threat to hearing yet devised by man. Aircraft companies conducted

considerable research and tested available commercial devices but none offers adequate protection against jet noise at full power. Sound pressure levels around a J57 jet engine, for example, are 130-140 db. at full power. With afterburner attached, levels of 160 db. have been recorded.

Most devices give a fair degree of attenuation for high frequencies. Ear plugs plus helmet-muff provide the best protection now available, yet hearing loss may still occur in some persons exposed to 130-140 db.

#### Selling Them on Ear Protection

PROMOTING the use of ear protective devices requires the same type of campaign that has secured acceptance of goggles and safety shoes. Ear protection is comparatively new, and its value must be explained. Also, loss of hearing is a more gradual type of injury and lacks some of the dramatic elements of accidental loss of an eye or a crippling foot injury.

At safety meetings a doctor, nurse or first-aid man might discuss ear protection and show the different types available.

It often helps to have a variety of devices, rather than trying to push a single type. Men are advised to try different devices on the job and report back to the safety or medical department. A choice seems to make any proposition more attractive.

Ear protection is a long-range educational program. It can be aided by posters, picture stories in employee publications, and demon-



EAR PLUGS must fit if hearing conservation is to be effective. It is best done by the medical department or by a trained technician. Ear openings differ in size.

strations at meetings. The selling job can usually be done best by a doctor, nurse, or first-aid man familiar with ear protection problems.

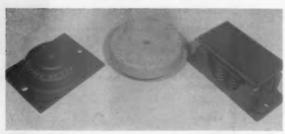
#### Fitting

Too much emphasis cannot be placed on correct fitting. Experience has shown that the best way is through the medical department. When fitted professionally, as by a nurse or technician, the program has more prestige.

The nurse or technician should fit each ear separately and choose a plug which fits tightly with only slight discomfort. Some temporary discomfort may be expected, but if plugs are too uncomfortable, they are not doing the job properly. Individual ear canals differ in size, and a person might need different size plugs for each ear.

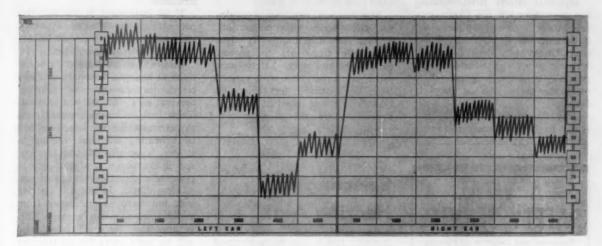
If the plant has no medical department or nurse, there should be at least someone who has been trained to fit ear plugs. A loose plug can be worse than none. While the fitting is being done, the nurse or technician should explain the reasons for the fitting procedure. It helps to emphasize that the plugs are fitted personally to each worker needing them. He should also be told the best way to judge their efficiency is to adjust and readjust them until the noise sounds least

At least three or four makes of



THREE TYPES of vibration dampeners. Left to right: rubber in shear with cork snubber, neoprene in shear, steel springs with cork snubber. (Delco Remy Div. of General Motors.)

# This simple chart can save you money



# It's an Audiogram

something every alert management has for protection of itself and employee against industrial hearing loss

Accurate audiometric tests at the time of employment, and periodic retests, are fast becoming a *must* for industry.

A precise and acceptable record of an employee's hearing ability can be the means of preventing thousands of dollars worth of hearing loss claims. When employee hearing tests are conducted on a Maico audiometer, the possibility of challenge is minimized.

Among audiometer makers, Maico is the world leader. In fact, more than 90% of the hearing tests made in America are made on the Maico precision audiometers.

Maico offers a wide variety of models, ranging from a pocket-type audiometer for in-plant hearing checks, to automatic audiometers where the testing load is heavy. Each instrument is designed for accurate testing and easy operation by a plant nurse or member of the personnel department. A Maico consultant can recommend the model which is best suited to your needs, and can readily train a staff member in its use.

Write today for a valuable free booklet, "Ears and Industry," which tells how an industrial hearing conservation program can be set up in your plant.



# MAICO ELEC

ELECTRONICS, INC.

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Company			
Address			

plugs should be available. A type that may be suitable for one man may be unsatisfactory for another.

Injurious effects from sweating ear protectors are not likely, provided there is no existing pathology in the external or middle ear. There is no danger to the drum head from wearing soft plugs. None of those generally used are long enough to reach the drum head, if properly fitted.

Any discomfort noticed at first is due to the slight pressure exerted

by the resiliency of the plug. It is not damaging to the external ear. The discomfort will disappear in a short time if the fit is good.

Many safety men wear goggles and safety shoes while on the job. It gives them added authority when they urge employees to protect their eyes and feet. Safety men might also experiment with various types of protection for their own ears. Suggestions based on personal experience are always more convincing. \* \* \*

first step. This will show whether or not hearing loss is correctable by a hearing aid, surgery, or other treatment.

If an instrument is advised, the patient has two choices. He may visit dealers and try various instrunents, or he may visit a clinic.

Clinics are maintained in some cities at colleges, hospitals, and societies for the hard of hearing. Services as a rule are non-medical. They include an audiometric test to determine hearing loss, selection of a hearing aid, and training in its use. Some also offer lip reading, speech correction, and guidance in personal and employment problems.

Most clinics do not sell hearing aids but have several types from which a selection can be made. This is important since no one brand will be satisfactory for all types of hearing loss.

Selecting the aid. The purchaser has a wide variety of devices from which to choose. Transistors and smaller batteries make modern aids less bulky, more efficient, and less expensive to operate. Choice of an instrument may be governed by these factors.

1. Service. Does the manufacturer have a representative in the customer's community or in a nearby city?

2. Cost and convenience. Standard models may vary in price from \$50 to \$200. Cost of batteries may be important.

If the dealer does not give an audiometric test, the otologist's report should be presented. If a test is given by the dealer, it should be compared with the otologist's report. Although there is a difference in audiometers, the curve of the test results should be approximately the same.

When trying instruments, these factors should be considered:

- 1. Improved hearing for speech is the objective.
- Speech must not be made uncomfortably loud.
- The wearer should hear comfortably, without tickling or pain.
- The instrument should have a reserve of power. If speech is barely audible with the volume turned to the loudest point, the instrument is inadequate.

Circle Item No. 57-Reader Service Card

# A VITAL SAFETY SERVICE

Prevention and Detection of Hearing Impairment with

Ambco AUDIOMETERS

Ambco OTO-CHEK

Simple to operate...especially designed for large scale screening... for rapidly determining the presence or absence of a hearing loss.

#### Ambco OTOMETER

A threshold air conduction screening audiometer . . . for measuring the degree of hearing loss.

These two new instructions—each performing a valuable function in safety programs—are battery operated and easily carried in carrying case.

# AMBCO, INC.

formerly A. M. Brooks Company Mirs, of Quality Auditory Equipment 1222 W. Washington Blvd., L. A. 7, Calif. Richmond 7-5131

# Selecting a Hearing Aid

MANY JOBS can be performed safely and efficiently by persons with impaired hearing. In other occupations, however, even a partially deaf person may be a hazard to himself and his fellow workers. Using the skills of deaf persons is an important rehabilitation measure.

To many persons, hearing aids are of considerable value. Properly fitted, they enable many persons to fill important jobs and live normal lives

It is important to purchase an aid from a reliable dealer. Some offer fairly good devices at unreasonable prices. Others advertise miracle devices at less than \$20—perfect hearing without batteries, tubes, cords, or ear buttons. A reliable aid cannot be expected at less than \$50, but price alone is no guarantee of quality.

Medical examination. An examination by an otologist should be the

THE LOW COST
NO MAINTENANCE
NOISE ABSORBER

FEDURES

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PAT. OFF.

FACTORY NOISE with SONOSORBER

GUARANTEED RESULTS! FREE ENGINEERING SURVEY, ANALYSIS and ESTIMATES. Write Today.

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5. Differences between comparable models of reliable manufacturers are usually minor.

Ear inserts. Important in an airconduction instrument is the ear insert molded to fit the ear. The mold, made of plastic, is usually included in the price of the instru-

The ear insert should fit properly. One that fits too loosely will cause a distracting squeal. One that is too tight will be uncomfortable.

Binaural hearing. A person who has normal hearing in one ear and little or none in the other has little difficulty understanding speech in a quiet room. In compensation cases, loss of hearing in one ear is usually rated at only 10 per cent disabling.

The person with one good ear, however, may have difficulty in determining the source and distance of sound. There is also decreased ability to understand speech when there is other noise in the room, or when many persons are talking.

Advantages of binaural hearing are: Localization, discriminative selection, speech sound discrimination, ease of listening, sound identification, and improvement in sound quality.

"Hearing glasses" enable the wearer to hear through both ears. Hearing aid circuits are contained inconspicuously in the temples of spectacles. Each temple contains transistors, a mercury cell battery (smaller in diameter than a dime), printed circuit, microphone, and other parts. Each side has separate volume controls.

Performance should not be judged on a hearing aid's performance in a sound-conditioned salesroom. It should also be tested where there is background noise.

Learning to use a hearing aid, like getting used to bifocals, is easy for some persons; for others it requires patience and persistence. The wearer must learn to accept and interpret both pleasant and unpleasant sounds, just as persons with normal hearing must do.

Users who are most satisfied with their aids are those who have learned to wear them all day, seldom varying the volume control.



Use The H. H. Scott Portable Sound Level Meter

Extensive research has shown that high noise levels can reduce efficiency and cause permanent hearing loss to your employees. Prevent expensive hearing loss police your plant regularly with the H. H. Scott Sound Level Meter. This extremely compact H. H. Scott meter weighs only 2 pounds seven ounces, so it can be held and operated with one hand. Operation is so easy that non-technical personnel can learn to operate it in five minutes.

• Flashlight sized . . battery powered. Ideal for sound survey use.

• Meets all standards of the American Standards Association.

• Rugged sub-miniature construction insures years of trouble-free service.

• Winner of the Electrical Manufacturing Award for "Outstanding Achievement in Product Design."

Designed for use with the H. H. Scott Portoble Sound Analyzer when detailed analysis of noise is required.



H. H. SCOTT Dept. SN-3 111 POWDERNILL RD., WAYNARD, MASS. EXPORT: TELESCO DETERNATIONAL CORP. 36 W. 40TH ST., N. Y. C.



YOUR FREE COPY OF "NOISE SIMPLIFIED"

#### **Board of Directors Votes Increase in Membership Dues and Prices**

SHARP INCREASES in costs during the past two years have led the Board of Directors of the National Safety Council to authorize an increase in membership dues. materials prices, and Congress exhibit space rentals. The increase was recommended to the Board by the Finance Committee following a detailed study of the Council's overall financial situation. It was the decision of the Committee that for the Council to maintain and improve the level of service to its membership a 10 per cent increase in membership dues and prices of materials would be required.

A review of the financial experience of the Council during the past eight years shows the necessity for this increase.

During the period 1951 to 1956 the Council absorbed mounting costs without increasing dues or the prices of materials. In mid-1956, the Board voted a 15 per cent increase, but at the same time established a 10 per cent discount to members. Thus the net increase in member prices since 1951 has been only 3.5 per cent.

Since 1956, the Council's publishing and distribution costs have climbed as much as 20 per cent, as shown in the following table:

—Paper	Up	20%
Printing	Up	11%
Postage	Up	17%
-Express Rates	Up	20%
-Art Costs	Up	16%
-Editorial Costs	Up	12%
-Office Handling Costs	Up	12%
-Overhead Costs	Up	8%
-Weighted average of		
all costs	Up	12%

If the Council is to continue its services and program, it must now augment its sales and dues income. This income is derived from four sources: (1) membership dues, (2) sale of materials, (3) sale of Congress exhibit space, and (4) sale of advertising space.

At its October 1958 meeting, the Board approved a 10 per cent increase in advertising rates. This increase was approved at that time because of advertiser contract re-

At its January 1959 meeting, the Board authorized increases in the three other sources of Council sales and dues income:

- Rental rates for booth space, beginning with the 1959 National Safety Congress and Exposition, will be increased 10 per cent.
- Membership dues will be increased approximately 10 per cent effective May 1, 1959.
- · Cost of Council materials will be increased approximately 10 per cent March 1, 1959.

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National Safety News

Hrischorn, Sept. 1952

Circle Item No. 60-Reader Service Card

### This is it! MAKE QUIET AREAS AT LOW COST with E. H. Noise Reduction Panels



E. H. Panels are 4 x 8' for easy building.

Free sample when requested

on company stationery.

Here is a real contribution to industry's need for low cost, soundproof and sound absorptive noise barriers. Can be cut in the field to any size and shape! Complete with erection members, soundproof doors and bucks. Write today for complete literature to Dept. NSN 3-9.

HANSSON, IN



711 Third Avenue, New York 17, N.Y. Enclose noisy machinery

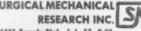
# WITH THE S M R



Soft, comfortable, resilient, the SMR EAR STOPPER adjusts itself to all shapes, turns and movements of the ear canal. Tends to anchor itself in the ear. Has a long life and is reasonable in cost. Furnished in a plastic case. Forty-five cents per set in gross lots.

SURGICAL MECHANICAL

1905 Beverly Blvd., L.A. 57, Culif.



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#### IN SECTION 5:

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REMOVAL OF ALL HAZARDS at their source is the ultimate goal of safety work but it has not yet been found practicable in many operations. Sometimes the exposures are too brief or infrequent to justify expensive changes in processes or equipment. And there are emergencies and breakdowns where men must undertake hazardous rescue or repair work.

Here personal protective equipment provides a second line of defense against injury, permitting many activities that would be impossible without it.

Goggles, face shields, and hard hats have saved many a worker from serious, even fatal, injuries. Less spectacular, but no less important, is the record of respiratory equipment in protecting men against air contaminants.

Because of its size and scope, the section on Personal Protection has been divided into two parts. Part I deals with protection for the eyes, head, and respiratory organs.

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# **Eye Conservation**

#### **Protection plus correction**

EYESIGHT is a priceless asset to the individual, to the employer and to society, and its value can't be appraised in money alone. Conservation, therefore, has a prominent place in industrial accident prevention.

Most companies require eye protection—goggles or face shields—on jobs where there is an obvious eye hazard, as in chipping and grinding. A few have established 100 per cent eye protection—for visitors as well as for employees. Such a measure is justified by the fact that many eye injuries occur on "non-hazardous" jobs.

Benefits of eye protection programs carry over to the home. Many a worker wouldn't start a do-it-yourself project without protection. This is often encouraged by selling equipment at cost or lending it for off-the-job use. The item is charged to the employee and credited when returned.

#### **Evaluating Eyesight**

Eye tests are invariably included in pre-placement examinations and in re-examinations. They aid safe placement and enable the employee to have defects corrected.

Mass examination of employees can be made quickly with screening devices. These detect substandard vision and appraise visual skills for various jobs. They do not diagnose specific defects.

Three screening devices, now available, have been in use for years and have proved satisfactory. Two may be purchased while the third can be obtained only on lease.

Scoring cards are provided with the instruments and service includes instruction in testing and evaluating results.

The tests take five minutes or less and may be given by trained laymen. Employees needing correction are referred to ophthalmologists or optometrists.

#### **Types of Protection**

For protecting eyes and face against various occupational hazards, four general types of equipment are used:

- 1. Goggles (safety glasses).
- 2. Face shields.
- 3. Welding masks and helmets.
- 4. Acid hoods.

For a detailed list and descriptions of various items of equipment for eye, head, and respiratory protection, see definitions from National Bureau of Standards Handbook H24.

#### Corrective Lenses

For visual defects, the wearer may have the correction ground in heat-treated lenses, or cover goggles may be worn over spectacles.

For optical reasons as well as convenience, corrective lenses are preferred. Most prescriptions can be ground in impact-resisting glass and in the improved plastics. Safety glasses, of course, are heavier than ordinary spectacles.

In prescribing corrective lenses for goggles or for ordinary spectacles, the refractionist should be familiar with the job. It is particularly important to know the distance of the work level from the eye.

Bi-focals may be required for some individuals and some will find tri-focals helpful.

Cover goggles are often preferred where the correction is complicated and expensive lenses would be subject to pitting on the job. They also have advantages where a nearsighted person requires deep minus lenses. These might be excessively thick at the edges yet too thin for adequate protection at the center.

Cover goggles are available in the cup type with heat-treated glass lenses and the wide-vision type with plastic lenses.

#### Types of Goggles

Safety glasses are available in many types for practically every occupation. The protective medium may be heat-treated glass, transparent plastic, wire screen, or lightfiltering glass.

Heat-treated lenses in spectacle frames, or cup goggles offer basic protection. The nature of the job and its eye hazards determine the specifications.

Spectacle goggles are worn for light or moderately heavy work, such as grinding, machine work, and assembling where working positions are not too close.

The frame must be rigid enough to hold the lenses in position in

NURSE checks settings of vision tester before giving an eye examination. Employees whose visual performance on the test indicates any defect are advised to see a refractionist. (International Business Machine Corp.)

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National Safety News, March, 1959

#### EYE PROTECTION FOR VARIOUS JOBS

		1	TYPE	E S O	FP	ROT	ECT	101		
TYPES OF EXPOSURE  (National Bureau of Standards Handbook H24)	CUP GOGGLES	SPECTACLES	WITH SIDE SHIELDS	PLASTIC EYE SHIELD	PLASTIC FACE SHIELD	WIRE SCREEN SHIELD	FILTER LENSES	RUBBER OR VINYL GOGGLES	ноорг	WELDING HELMETS
Heavy impact, large particles—Chipping, calking, some riveting operations, sledging in quarries.										
Moderate impact, dust and small flying particles—Scaling and grinding metals, stone dressing where quartz is not involved, some woodworking operations.										
Metal sparks and spatter—Electric spot and butt welding; no exposure to excessive energy or glare.										
Splashing metal—Babbitting, pouring lead joints for pipes, casting hot metal, dipping in hot metal baths.									les in	
Splashing liquids—Acids and caustics, dipping in galvanized tanks, some japanning operations.							-			
Reflected light and glare—Long exposure to light reflected from snow, water, roads, etc.; incidental glare from furnaces, working near acetylene welding.										
Injurious radiant energy—Moderate reduction in visible radiant energy—Oxyacetylene welding and cutting.										
Injurious radiant energy—Large reduction of visible radiant energy—Arc welding.										

front of the eyes. The nose bridge should be adjustable, or goggles should be available in enough sizes to fit various faces.

Side shields of metal or plastic provide protection against light objects flying from the side. They should be used where operations are close together, or where employees work together on the same operation.

Cup goggles are used for heavy grinding, machining, chipping, riveting, work with molten metals and similar operations.

The cup should be wide enough to protect the eye socket and distribute the impact from any blow over a wide area. The cup should be flameproof, corrosion-resisting, and non-irritating to the skin. Mask-type goggles, with frames of soft vinyl or rubber, offer protection against splashes of corrosive chemicals and exposure to fine dust. This type is obtainable with lenses of heat-treated or untreated glass or acid-resistant plastic. Some types may be worn over spectacles. Ventilated types are less troubled by fogging.

**Dust goggles,** leather mask type, for non-corrosive dusts, are made with heat-treated, untreated or filter lenses. Wire screen ventilators around the eye cup provide air circulation.

Miners' goggles of corrosion-resisting wire screen are used for work underground and in other locations where fogging is a serious problem. The screen is coated a dull black to reduce reflection. Plastic lenses, greatly improved in recent years, are equal to optical glass in light transmission and freedom from distortion. Corrections may be ground in them. They are light in weight and resist fogging. They are useful for spotwelding, as molten metal does not adhere to plastic as readily as to glass.

Plastic withstands considerable impact but is marred or scratched more easily than glass.

Plastic lenses should be cleaned with liquid cleaners and soft tissues rather than silicone-treated tissues.

**Specifications.** Ease of cleaning and sterilization is essential. Most types on the market meet these requirements.

Goggles should be fitted as close to the eyes as possible without touching the eyelashes to give the widest possible angle of vision.

Minimum permissible size for oval lenses is 44.5 mm. in the vertical dimension and 48 mm. in the horizontal. Round lenses should be 50 mm. in diameter.

Lenses should have no appreciable distortion or prism effect.

Strength of heat-treated lenses (resistance to impact) should conform to specifications of the Federal Standard Stock Catalog, the government's official purchasing guide, Specification GGG-G-501B.

Sweatbands, worn across the forehead in hot, humid locations, help prevent fogging of goggles and spectacles.

Non-fogging compounds, applied to the lenses, help to keep the glass clear.

#### **Face Shields**

Transparent plastic shields give eye and face protection on such jobs as metal-sawing, working with chemicals, buffing, sanding, light grinding, or bottle manufacturing.

They should not be used for welding, heavy grinding, or where resistance to severe impact is necessary. Shields may be worn over spectacles.

Wire mesh shields are used for pouring low-melting-point metals, as in babbitting. The mesh stops splashes of metal and allows better ventilation than a solid shield.

#### **An Eight-Point** Vision Program

- 1. Job study to determine eye hazards and types of protection.
- 2. Modern first-aid emergency eye care.
- 3. High standards of medical and surgical techniques for eye injuries.
  - 4. Modern visual testing techniques.
- 5. Minimum visual standards for placement.
- 6. An effective referral system for correction of visual defects.
- 7. Study of illumination and color factors in visual efficiency.
- 8. Education in the importance of eye protection and correction of vis-ual defects.



CUP-TYPE goggles provide the protection needed for such operations as grinding and chipping. (Allegheny-Ludlum Steel Corp.)

#### **Hoods and Helmets**

Hoods (loose-fitting) and helmets (rigid frame) of various types are worn to protect the face and head against hazards which do not involve heavy impact.

Some types of helmets include a hard hat.

These are equipped with windows but goggles may be worn underneath. If toxic fumes, dusts, or gases are encountered, an air line should be supplied. As these hoods are rather warm, an air line is also desirable for comfort.

Fabric hoods protect the wearer from nuisance dusts and paint

Fire-resistant duck, asbestos, and aluminized asbestos are used for varying degrees of exposure of heat, as in furnace and burning operations and fire fighting.

Rubber, neoprene, plastic film, and fabric impregnated with rubber or plastic provide protection against splashes of acids, caustics, or organic solvents. Not all of these materials are resistant to all exposures and the manufacturer should be consulted.

Hoods and helmets are frequently worn as part of a complete outfit giving head-to-foot protection.

#### Harmful Rays

Glass which filters out harmful ultraviolet and infrared rays is available in many types of goggles, face shields, and helmets. These filter lenses are worn for welding and cutting, furnace and boiler observation, and other operations where there are high temperatures and excessive glare.

Didymium glass is used for protection against bright yellow encountered in glass blowing and similar operations. It is also useful for some precision operations in laboratories.

Melters' goggles of cobalt blue glass come in spectacle and cup types in graded shades. Lenses with color in the upper half and clear glass in the lower half are also obtainable.

Sun glasses are not effective rayfilter glasses for most industrial exposures. They are designed for protection against discomfort caused by sun glare. The better glasses -To page 102

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Protection of Heads, Eyes, and Respiratory Organs, Safety Code for, Z2-1938 (Handbook H-24, National Bureau of Standards). Under revision.

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National Safety News, March, 1959

### **Respiratory Protection**

#### How to survive in unbreathable air

AIR CONTAMINANTS, the undesirable by-products of many industrial processes, provide some of the most serious problems of occupational and public health. These contaminants range from relatively harmless "nuisance" substances to toxic dusts, vapors, mists, and gases.

Removal of contaminants at the source and enclosure of processes to reduce concentrations in the workroom air should be the aim of the safety and hygiene program but leaks and breakdowns of equipment may occur. There are also operations where exposure is brief or infrequent. For such situations personal protection is needed.

The worker's air intake may be safeguarded by three principal methods:

- 1. Mechanical filters to remove dusts and mists.
- 2. Absorption or chemical reaction to remove gases and vapors.
  - 3. Supplied air.

Types. Five general types of respiratory equipment are:

- 1. Canister gas masks.
- 2. Chemical cartridge respirators.
- 3. Filter respirators.



SERVICING on the job keeps gas masks and respirators functioning efficiently. (Diamond Alkali Co.)

4. Supplied-air equipment (hose masks and air-line respirators).

5. Self-contained apparatus supplying oxygen or air.

Each type of equipment has a definite field of usefulness, as well as limitations. Manufacturers and dealers therefore want to know the type of exposure when equipment is ordered.

Approval. Equipment which meets accepted standards carries the label of the Bureau of Mines. Approval specifies type of exposure as well as design and construction.

#### Gas Masks

A gas mask consists of a face piece connected by a flexible tube to a canister. Inhaled air is drawn through the canister which cleans it chemically. No one chemical yet discovered will remove all contaminants, so the canister must be chosen for the exposure.

The greatest range of protection is provided by the universal mask for use against combinations of acid gases, organic vapors, ammonia, carbon monoxide, and smokes. However, as the number of gases increases, the service time of the canister decreases.

Canister gas masks with full facepiece are for emergency protection in atmospheres immediately dangerous to life. Their effectiveness is limited to concentrations of two per cent by volume, except for ammonia, for which the limit is three per cent.

Characteristics. Types of gas masks, their identifying colors and uses are:

White-Acid gases, such as hydrogen sulfide, sulfur dioxide, chlorine, hydrocyanic acid.

Black-Organic vapors, such as aniline, benzene, ether, gasoline, carbon tetrachloride, chloropicrin.

Green-Ammonia gas.

Blue-Carbon monoxide.



SANDBLASTER dons safety equipment before working in booth. Operator is supplied with air through dust-tight mask. (MSA.)

Yellow-Combination acid gas and organic vapor.

Brown-Combination acid gas, organic vapor and ammonia gas.

Red-Universal-all industrial gases, including carbon monoxide, smoke, and fumes.

White with green stripe-Hydrogen cyanide.

White with yellow stripe-Chlorine.

#### **Cartridge Respirators**

Chemical cartridge respirators usually have a half-mask face connected directly to a small container. Chemicals are similar to those used in gas masks.

Cartridge respirators are approved only for non-emergency situations -for atmospheres which are harmful only after prolonged or repeated

For hot jobs. A heat-exchanger cartridge permits work in excessively hot atmospheres. When the worker breathes in, heat is stored in the cartridge; when he exhales, heat is removed. Inhaled air is then reduced to a tolerable temperature. This respirator is worn with a specially designed hood.

#### **Filter Respirators**

Protection against any form of particulate matter can be provided by a mechanical filter respirator. Major items to be considered are resistance to breathing offered by the filter element, adaptation of

facepiece to faces of various shapes, and fineness of particles to be filtered out.

ASA Code Z-2 requires that the complete respirator show a resistance not in excess of 50 mm of water at an inhalation rate of 85 liters of air per minute. Resistance to exhalation under the same conditions may not exceed 25 mm. Commercial respirators are usually held to considerably lower resistances.

Mechanical filter respirators are not effective against solvent vapors, injurious gases, or oxygen deficiTypes of mechanical filters approved by the Bureau of Mines are:

- 1. Pneumoconiosis producing and nuisance dust respirators, for such dusts as aluminum, cellulose, cement, coal, charcoal, coke, flour, gypsum, iron ore, limestone, and wood.
- Toxic dust respirators, for protection against toxic dusts that are not significantly more toxic than lead, such as arsenic, cadmium, chromium, lead, manganese, selenium, vanadium, and their compounds.
- Mist respirators, for protection against pneumoconiosis-producing, chromic acid, and nuisance mists.
- Fume respirators, for protection against fumes (solid dispersoids or particulate matter) formed by condensation of vapors, as from heated metals or other substances.

#### Supplied Air

Hose masks. Atmospheres immediately hazardous to life require air supply from a point beyond the contaminated area. With a hose mask, air is normally supplied by a blower. The wearer can inhale through the hose when the blower is not operating.

Hose lines (with at least a 1-in. connection) are recommended rather than air lines connected to a compressed air system for most operations. In a case of failure of air supply, it is possible to breathe through a considerable length of hose.

Hose masks are not approved with more than 150 ft. of hose or where inhalation resistance exceeds 2.5 in. of water, or the exhalation resistance exceeds 1 in. of water.

Attachments of additional hose should not exceed the total prescribed length. It should be approved for use with that type of mask and should have approved couplings. The blower should be located so that only fresh, clean air is supplied to face masks.

The hose mask should always be used for work which involves entering tanks or pits where there is a dangerous or unknown concentration of dust, mist, vapor, or gas, or oxygen deficiency.

Harness to pull the hose lines should be inspected before use. Component parts of harness must be able to withstand a pull of at least 250 lbs.

Air-line respirators, connected to compressed air lines, provide essentially the same protection as hose masks. They are not intended for atmospheres immediately hazardous to life where the wearer could not escape if failure of the air supply required him to remove the respirator.

This respirator differs from the hose mask mainly in two features:

#### POTENTIAL ASPHYXIA HAZARDS

(Globe Industries, Inc.)

Class	Туре	Preventive Measures
1. Diseases	a. Cardiac conditions     b. Asthmatic, circulatory cases     c. Hypertension sufferers	Regular physical checkups Constant surveillance and encourag ment to observe doctor's advice Employee instruction and job selection
2. Equipment	a. Chemical, oil tanks     b. Vats and containers     c. Poorly ventilated rooms	Hoods over tanks, etc. Exhaust systems Make-up air systems Oxygen masks (self-contained breating apparatus) for special areas ar jobs Employee training
3. Electricity	a. Power and transmission lines b. Powered equipment c. Transformers d. Portable power tools e. Lightning	Signs, identifying color, guard rails an fences Maintenance and inspection of tools Proper grounding of tools Isolation of areas Employee training
4. Asphyxiating gases	a. Carbon monoxide     b. Exothermic and endothermic atmospheres     c. Carbon dioxide     d. Volatile hydrocarbons	c Signs, identifying color, guard rails an
5. Chemical irritants	a. Chlorine b. Ammonia c. Hydrochloric acid d. Hydrogen sulphide e. Lime f. Sulphur g. Hydrofluoric acid gas h. Nitrous fumes i. Chloride of lime j. Bromine k. Beryllium l. Nitric acid m. Phenols n. Phosgene o. Benzol p. Anticholinesterase agents q. Naphthol r. Sulphuric acid s. Hydrocyanic acid	-fences Hoods and exhaust equipment Continuous atmosphere sampling an checking Regular maintenance of all equipmen pipes, fittings and tanks Oxygen masks (self-contained breath ing apparatus) for special jobs an areas not rendered safe by other methods Employee training

## Pulmosan





Dust, chemical cartridge, air supplied, and gas masks. Bureau of Mines Approved. Equipped with Hoods.

## Pulmosan

#### **HELMETS** and **HOODS**



Dust, sand blast, air supplied, paint spray, acid splash, welding, Babbitting, etc.

### Pulmosan



FACE & EYE PROTECTION

Face shields, goggles, spectacles for grinding, chipping, welding, chemical splashes, fumes, smoke, etc.

## Pulmosan

#### SAFETY CLOTHING



Gloves, mittens, aprons, sleeves, suits, spats, etc. Leather, asbestos, rubber, plastic, flame-proofed duck. heels

in your

safety

program?

Have you provided equipment to protect employees against every possible industrial hazard inherent in your operation?

Does the equipment you have give the best available protection in each particular danger spot?

Safety allows no room for Achilles' heels. That's why PULMOSAN makes many hundreds of items of protective equipment of all types. In one of the PULMOSAN catalogs, you can be sure of finding the equipment that is specifically designed to cover each of your safety needs.

Experienced in selecting the correct equipment for the job, PULMOSAN offers you expert assistance in reviewing your safety needs. Your inquiries are invited.

WRITE FOR COMPLETE
DESCRIPTIVE CATALOGS



PULMOSAN SAFETY EQUIPMENT CORPORATION

164 Pec Re Shuer, Brusslyn 17, N. Y. STerling 9-0200 1007 Wartington Ave., St. Laule, Mo., Clientout 1-2222

it has a hand-operated, quickly detachable coupling connected to the belt or body harness so that the operator can connect to a compressed air hose, also a flow-limiting device to permit air flows only between 2 and 20 cfm.

A trap and filter installed in the compressed air line ahead of the masks to separate oil, water, scale, or other extraneous matter from the air stream is desirable.

An air-pressure regulator in the line is required if air is supplied at a pressure in excess of 25 psi., also a pressure release valve which will operate if the regulator fails.

Supplied-air respirators are the best type for continuous use at one location. Other types may give adequate protection, but offer breathing resistance and are consequently more fatiguing.

To obtain clean air, the compressor intake must be kept away from sources of contamination. The compressor should be well maintained. It must not run too hot, as dangerous amounts of carbon monoxide can be produced by decomposition of lubricating oil.

Air-supplied suits. Sometimes rescue or emergency repair work must be done in atmospheres extremely corrosive to the skin and mucous membranes, in addition to being acutely poisonous. For these conditions, complete suits of impervious material with breathing equipment are available.

If a hose line is used, it should be

Abrasive blasting requires an adequate supply of filtered air, also mechanical protection for the head and neck-either an impregnated cloth hood or a helmet of some rigid material. It should be covered both inside and outside with a plastic material, such as soft rubber, to increase both comfort of wearer and resistance to abrasive.

A window of transparent material, suitable for optical use, protected from the abrasive by a 30to 40-mesh fine wire screen should be provided. Both window and protective screen should be readily replaceable.

#### **Self-Contained Apparatus**

For work in atmospheres immediately hazardous to life at distances more than 150 ft. from the source of fresh air, self-contained oxygen-breathing apparatus should be used.

Two principal types of self-contained apparatus are: (1) Compressed air or compressed oxygen type; (2) Internal generation type which produces oxygen by reaction of chemicals in the canister with the moisture in exhaled breath.

#### Care of Equipment

A central station for care and maintenance of respiratory equip-

connected to the suit itself as well as to the helmet. Unless well ventilated, such a suit is fatiguing and dangerous to wear for long periods. References—Respiratory Equipment

National Safety Council

Accident Prevention Manual for Industrial Operations, 1955. Hard Hats; Data Sheet D-425.

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American Standards Assn.

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U. S. Bureau of Mines

List of Respiratory Protective Devices.

ment is desirable where many respirators are in use. Such a unit can also handle distribution and maintenance of other personal protective equipment.

Each employee should be provided with two respirators and either a locker or a hook at the central station. Each respirator should be branded or tagged with the employee's number.

Cleaning and disinfecting. All parts, except canisters and cartridges, should be cleaned after use. Facepieces, air lines and hose may be washed with soap and water, rinsed, and dried.

All respiratory devices should be disinfected before being passed from employee to employee. Methods of sterilizing include:

1. Immersion in solution of quaternary ammonium salt detergent. This material is not injurious to skin or to rubber.

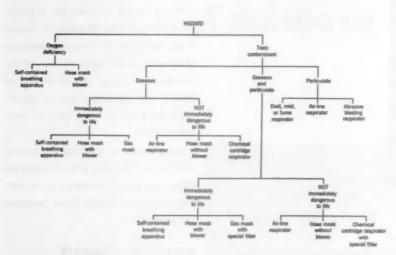
2. Subjection to a moist atmosphere of antiseptic gas, such as formaldehyde, for 10 minutes.

3. Immersion for 10 minutes in a solution of formalin made by dissolving 1 part of 40 per cent formaldehyde in 9 parts of water.

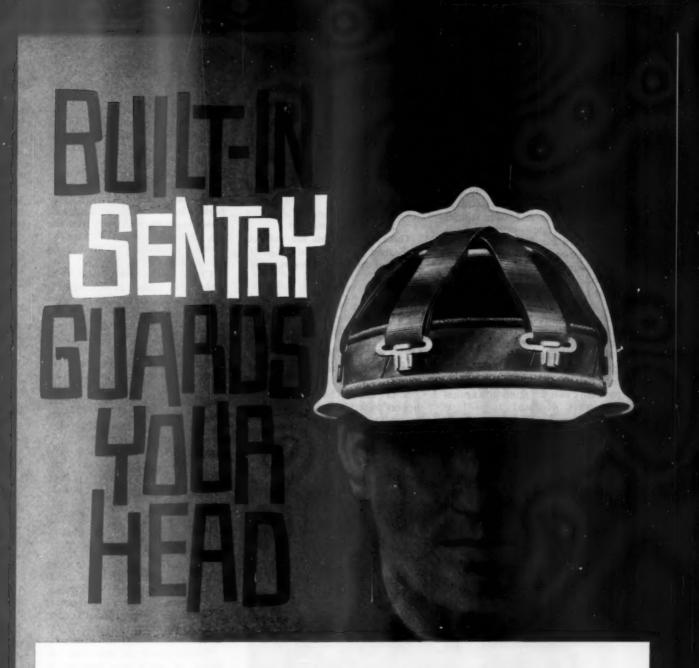
Parts should be rinsed thoroughly after sterilizing to remove traces of disinfectant, then dried.

Elastic head bands may be damaged by sterilizing but they should be washed with soap and water.





RESPIRATORY protective devices for various types of exposure. (Reprinted from Information Circular 7792, U. S. Bureau of Mines.)



#### Power-Bloc suspensions by E.D. Bullard Company

No matter how adjusted, a Bullard Power-Bloc suspension always automatically guarantees a safe limit of clearance between the top of your hat and the inside of your hat's shell. This lets your safety hat or cap work with shock absorber-like action, blocking power of overhead blows from crushing or lacerating your skull. Your hat is lighter, cooler, and more comfortable with a Power-Bloc suspension. Sweatband is made from a remarkable new foam plastic that actually shapes itself to your head as worn. Its highly absorbent characteristic keeps

perspiration out of your eyes... yet the sweatband can be easily washed new in soap and warm water.

Modernize your "HARD BOILED" hats and caps in seconds

Replace all your old Bullard hat suspensions for the extra comfort and safety of **Power-Bloc**... the suspension that makes all others obsolete.



Write or call your distributor

# **Heads Under Cover**

Protection for the skull and its contents

HEAD INJURIES caused by falling objects are routine hazard in many industries and such injuries are usually serious—often fatal.

The hard hat, first introduced in mines shortly after World War I and much improved since then, has an impressive record of lives saved. Head protection has become standard practice in other industries, including construction, logging, shipbuilding, and many types of maintenance work.

Head protection is also becoming general among public utility companies where linemen wear protective hats for protection against live wires overhead as well as against impact.

Protective hats are also useful where there is danger of bumping the head against overhead structures.

Wearing protective hats is included in many labor contracts and the unions have helped in educating their members on the need for head protection.

Requirements. A protective hat should have:

- 1. Resistance against impact.
- 2. Resistance to fire.

- 3. Resistance to moisture.
- 4. Light weight.
- 5. Insulation against electricity around live equipment.

These requirements are outlined in Federal Specifications GGG-H-142: Construction Workers' Helmets.

Types. The type in general use has a brim all the way around, protecting the head, face and back of the neck.

The cap type is sometimes preferred where a brim might be in the way.

Some models have brackets to support miners' cap lamps or welding masks.

#### Construction

Materials most widely used are laminated plastic, glass fiber, and aluminum alloy.

Laminated plastic molded under high pressure provides a hat that resists impact and effects of water and oil. It provides effective insulation against electricity.

Glass fiber impregnated with resin has a high-strength-weight ratio; high dielectric strength; and resistance to moisture, caustics, and acids.

Aluminum alloy is light in weight and meets all requirements for resistance to impact and moisture, but it is a good conductor of electricity. Metal hats should not be worn where there is danger of electrical contact.

The hard shell of the hat is supported by a cradle or hammock which keeps the shell away from the hat, cushions it against blows, and permits circulation of air around the head.

Cradle and sweatband should be replaceable because of deterioration through perspiration. This is important for sanitary reasons, since hats may be worn by more than one person. The shell can be sterilized by any of the common methods.

For cold weather a lining of water-resistant cloth may be attached to the hat to protect head, neck and ears.

On locations exposed to strong winds, such as bridges and oil derricks, a chin strap is useful.

An eyeshield of transparent plastic may be attached to some types of hats. It is hinged under the peak and lies flat against the peak when not in use.

Weight. A maximum of 14½ oz. for the complete hat is specified by Federal Specifications.

Colors. Hats are available from most manufacturers in seven standard colors—white, gray, red, green, blue, brown, and black. Other colors are available on special order. Color is permanent because it goes all the way through the material.

Special colors are sometimes ordered, or stock hats painted, to match the color used by the company on vehicles or in advertising.

Hats which glow in the dark are obtainable on special order.

Distinctive colors and designs are also used to designate the wearer's department or trade. This is often done in plants where certain areas are restricted to authorized employees.

No standards have yet been compiled for the use of color for identification of the wearer. Many civil defense groups have established codes and some industries have adopted similar plans. Following is a typical code:

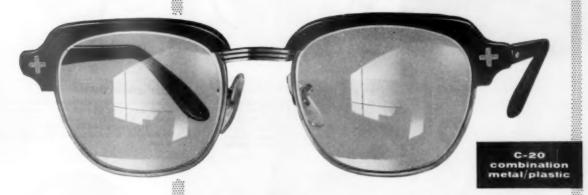
-To page 106



CLEANING, sterilizing, and repairing hard hats on a highway construction job.



# This new Bausch & Lomb safety frame has got it...PLUS



Newest concept in safety eyewear, designed by Bausch & Lomb to meet the needs of today and tomorrow. Smart, with superior fitting qualities and unequalled strength, C-20 represents the finest in scientific eye protection. Spatula or riding bow temples and Bausch & Lomb Redy-Fit side shields available for on-the-job interchangeability. See it now; call your supplier, or write for information: Bausch & Lomb Optical Co., 90339 Smith Street, Rochester 2, New York.



Safety Eyewear

protection+economy+worker acceptance

# MODERNIZE WITH THE COMPLETE WILLSON LINE

for the finest in eye, face, hearing, head, and respiratory protection

(representative showing from more than 300 products in the Willson line)





style CC70

#### CUP GOGGLES

William Kover-Mor with durable lightweight nylon cups that fit easily over prescription glasses. Wire screen ventilators and slotted lens rings assure continuous air flow. 50 mm lenses. Also available in welding goggle type, CW70.



style 15

#### GEODETIC STRAP SUSPENSION SAFETY HATS AND CAPS

Full-protection safety hats...featuring "Geodetic" auspension developed in Cornell Aeronautical Laboratory. Tamperproof protection against the shock of impact! Choice of phenolic (Illustrated), fibergias, or insulating types, hat or cap styles.

#### WILLSON DISTRIBUTORS IN ALL MAJOR CITIES ...

siblt the nearest one for details, demonstrations, prices on the above and many other Willson safety products that can bring extra efficiencies, extra economies to your program.



style 101



All-around snug fit for complete cleaure, over spectacles. Wide, distortion-free ecctate less. Ventilated green that vinyl fit Unventilated and indirect models, vinyl or gectate lesses also sysfleble.



#### PROTECTO-SHIELD

For protecting the entire face, or a large pofit. Style shown has 6" length, .040' transparent clear acetate visor, fibre he with brow guard, adjustable heedgear, visor sizes, clear and green shades, also ave



#### MONOMASK

Automatically shapes to the face to assure a positive protective seal and exceptional wearer comfort. B.M. approved for protection against all dusts, pneumoconlesis-producing mists, and chromic-acid mist. Compact design, few paris. Packed in plastic box.



style WFE

#### STREETWEAR-STYLE SPECTACLES



#### FIBERGLAS WELDING HELMETS



series 800C

INTERCHANGEABLE RESPIRATORS One Willson #900C respirator nine for protection against all radioactive duests, mists, meta gases, when fitted with the



style AF

#### **METAL SPECTACLES**



#### SOUND BARRIER





WILLSON PRODUCTS DIVISION RAY-O-VAC COMPANY READING, PENNSYLVANIA

#### **Eye Conservation**

-From page 92

conform to optical standards but many of the cheaper ones show considerable distortion.

Welding helmets provide protection for the eyes and face under the severe conditions of arc welding. They are attached to headgear so they can be raised for placing the work. Impact goggles worn under the helmet provide protection when the helmet is raised.

Helmets are made of dielectric fiber resistant to sparks, molten metal, and flying particles, and having low heat conductivity. Replaceable cover glass protects the filter plate.

Some helmets have a lift-front glass holder which permits rapid inspection of work without removing the helmet.

Welding hand shields are used on operations where a helmet is not practical, and on tack welding, setup work, inspection, and time study work. Construction is similar to welding helmets.

Filter Lenses. The following shade numbers are listed in National Bureau of Standards Handbook H24:

No. 3—For protection against glare or reflected light, spot welding, light brazing.

No. 4 or No. 5—Light acetylene cutting and burning.

No. 6—General acetylene welding, or welder's helper or setup on arc welding.

No. 8—Heavy acetylene welding or cutting, or very light arc welding.

No. 10—Arc welding up to 250 amperes.

No. 12—Arc welding of more than 250 amperes, atomic hydrogen welding.

No. 14—Carbon arc welding.

Goggles are available in shades up to No. 8; higher numbers in helmets.

Heat-treated cover lenses can be provided to protect filter lenses against pitting and scratching. Heattreated filter lenses are also available.

## DEVICES FOR EYE, HEAD, AND RESPIRATORY PROTECTION

Definitions from National Bureau of Standards Handbook H24\*

Protector. A device placed in front of or over the eyes, face, or head to afford protection from the hazards in industrial processes or from the natural elements,

Goggles. An optical device worn in front of the eyes, whose predominant function is protection to the eyes only.

Face Mask. A device worn before the eyes and a portion or all of the face, whose predominant function is protection to the eyes and face.

Helmet. A rigid device worn by the operator which shields the eyes, face and neck, and a portion or all of the other parts of the head and is held in place by suitable means.

Hood. A non-rigid device which completely covers the head, neck, and portions of the shoulders so as to exclude dust and flying particles.

Shield. A device held in the hand, or supported without the aid of the operator, whose function is protection to the eyes and face.

Gas Mask. A device worn on the face, and so arranged that the inhaled air is drawn entirely through a canister which cleans it chemically.

Supplied-Air Respirator. A device designed to supply the wearer with air suitable to breathe while surrounded by a contaminated atmosphere, and to prevent the latter from being inhaled.

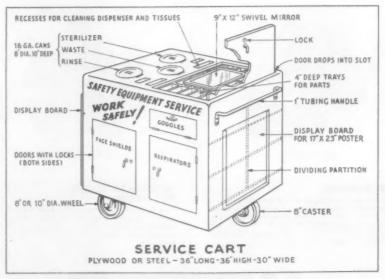
Hose Mask. A supplied-air respirator having a tight-fitting face-piece to which is attached a hose through which air may be forced by a blower, and through which the wearer can inhale whether the blower is operating or not.

Air-Line Respirator. An air-line respirator is a supplied-air respirator designed to be connected by a hose to a supply of fresh air under positive pressure sufficient to maintain a continuous flow into the facepiece.

Filter Respirator. A device designed for the wearer to inhale the surrounding atmosphere after it has passed through a filtering medium to remove the impurities. The filtering medium may chemically absorb or mechanically obstruct the impurities.

Cartridge-Type Respirator. A filter respirator whose filtering equipment is carried in one or more cartridges mounted on the facepiece. Such a respirator may be a mechanical filter respirator, or a combination of both.

\*NBS Handbook H24 (ASA Safety Code for Protection of Heads, Eyes, and Respiratory Organs), out of print for several years, is reported to be in the final stages of revision under procedure of the American Standards Association.



SERVICE CARTS for cleaning, sterilizing, and making minor repairs on eye and respiratory equipment keep devices in good condition. They also advertise protection.



# THE BIG SHEET IN THE DISPENSER WITH NO MOVING PARTS

You have enough costly troubles without fixing dispensers. Magic Dispensers are trouble-free. No moving parts. Nothing to break, maintain, adjust or replace. The compact 20 gauge steel dispenser is pilfer-proof; locks with a key. Needs no screws, no drilling. Just stick it to the wall.

Magic Silicone tissue sheet is 50% larger and twice the tearing strength. Each sheet

is big enough to clean the largest of safety goggles. Every square inch is packed with Silicone's Sparkle Power—and both sides of the sheet. Magic tissue is interfolded, serving only one sheet at a time—not in wasteful bunches. It's the interfolding that does it, and that's an exclusive feature with MAGIC.



MAGIC LENS TISSUE

NO MOVING PARTS NEVER NEEDS TO BE REPAIRED

Dispensers shown in open position.

Magic Heavy-Duty Cleaning Station is for dirty, oily areas or where Anti-Fog protection is needed on plastic or any eyewear. The Heavy 20 gauge steel Dispenser has no moving parts, locks with a key.

Magic Lens Cleaning and Anti-Fogging Fluid comes in pressure cans; no pumps or plungers; no refilling; no bottle troubles or breakage. 1400 applications per can.

Heavy-Duty Paper, not silicone-treated, is a superb super-strong, wet strength tissue. No scratching on plastic and no lint.

**Exchange all your other Stations for Magic FREE** 

MAGIC Pop-Up Pack in self dispensing box for your desk or any place in the office, plant or laboratory, \$11.95 carton of twelve boxes.



T.M. REG. JU.S. PAT. OFF.
Cleaning Stations

The Silicone Paper Company
of America Inc.
75 East 45th Street, New York 17, N. Y.

NO MOVING PARTS

#### MAGIC SILICONE TISSUE

Magic Lens Tissue.....Carton \$8.40 (Six 800 sheet refilis per carton) Magic Lens Tissue Dispenser (Free when exchanged)..each \$2.50

#### HEAVY-DUTY SYSTEM

Heavy Duty Paper....Carton \$11.60 (18 giant 760 sheet refills per carton)

Cleaning & Anti-Fogging Fluid 12-12 oz. cans ...... Carton \$12.50

#### Magic Heavy-Duty

Dispenser.....each \$5.95 (Free when exchanged)

All prices F.O.B. Shipping Point.

# HEAD & EYE **PROTECTION** means **DEPENDABLE** with

Only in the Dockson line can you find such quality, comfort and economy.

ECONOMY!

Practical, up-to-the-minute designing based on our many years of experience . . . good quality materials . . . careful fabrication and constant, strict inspection put Dockson products in a quality class far above their economical pricing.

Their many exclusive and desirable features contribute greatly to their efficiency, safety and operator comfort.

You'll find a Dockson product to meet your requirements both in quality and in realistic cost.

DOCKSON CORPORATION





Model 1225 Turretype Handshield



Model 1105 Face Shield



Model 1145 Mari



Model 90 Cover-Spectacle Goggle



Model 40 Spectacle Goggle

Model 26 Spectacle Geggle



RA-110 Light

#### **Heads Under Cover**

-From page 98

Red-Pipe workers.

Blue-Fitters.

Green-Welders.

Buff-Rigging.

Yellow-Electrical.

Black-Labor.

Gray-Burning.

Brown bottom, white top-Painters.

Red bottom, blue top-Machinists.

Gray bottom, white top—Shear and blacksmith shops.

Lavender-Expediters.

Aluminum—General foremen.

Brown bottom—yellow top—Caulkers and sanders.

A black line on a helmet denotes a foreman and a red line a leaderman. Badge numbers are also stenciled on the front of each helmet

#### Work Caps

Where protection against impact is not required, light cloth or paper caps are worn to protect the hair against paint splashes, dust, oil, and other non-corrosive substances.

One type of disposable work cap is of heavy Kraft paper treated with neoprene and a flame retardant. The material is water-repellent and resistant to acids and alkalis. Cost is said to be about 30 per cent less than most cloth caps.

#### Headwear for Women

Women are seldom employed in peacetime occupations where protective hats are required. Their hair, however, provides a problem around moving machinery. Much effort has been expended in designing headwear that provides adequate protection and is reasonably attractive in appearance. Much more effort is expended in persuading women to wear it.

Scalping may occur at points where hair may come in contact with rotating parts, or where enough static is produced by the machine to lift the hair.

Enclosing the machine may be practicable in some operations but women who work around machinery should wear caps which cover the hair completely. Hair covering is

generally desirable from the standpoint of cleanliness.

Hair covering should be made of durable fabric which will withstand repeated laundering. Design should be simple so that pressing may be done by machine.

Flame-retardant material should be used if worn near sparks or flame.

Caps with peaks provide warning before the head comes into contact with a moving object. They should be provided in a sufficient variety of head sizes or with a range of adjustment to fit all persons.

Hair nets, turbans, or berets, preferred by many women, are not considered sufficient protection around moving machinery. Sometimes their use is a compromise with feminine taste. \* \* \*

# Administering an Eye Protection Program

Supply and distribution. Some companies keep the stock in a central supply department. In larger plants, goggles, shields, and repair parts may be kept in each shop.

In some plants, goggle carts with trained attendants make regular rounds cleaning, adjusting, repairing, and replacing goggles on the job.



WELDING HELMETS of dielectric fiber with low heat conductivity resist sparks, molten metal flashes, and flying particles. Garments of chrome leather or flameproofed fabric are also needed.

Fitting. All goggles, plano as well as prescription, should be fitted carefully. Glasses that don't fit can cause a lot of opposition to eye protection.

Some optical companies offer instruction in fitting plano goggles. Prescription glasses should be fitted by a refractionist.

Cleaning. Goggles and spectacles become smudged and facilities on the job encourage frequent cleaning. Cleaning stations may dispense silicone-treated tissues or cleaning liquid and tissues. Only the latter should be used for plastic lenses.

Sterilizing. Goggles worn by more than one employee should be sterilized before reissue. Ability to withstand sterilizing by accepted methods should be included in any specifications.

Who Pays? For plano goggles, the most common practice is for the company to issue them without cost to employees and to repair or replace those damaged on the job. Often a deposit is required to discourage loss of equipment.

Few companies provide prescription goggles without charge but many assume varying percentages of the cost of refraction and the

A good example. Do supervisors and visitors wear eye protection when circulating in departments where it is required? It makes enforcement a lot easier.

#### Vision Tests Include . . .

Near acuity. Ability to focus and see well with both eyes separately at a distance of 15 in. This is the distance at which most machine and office work is done.

**Distance acuity.** Ability to focus eyes at a distance of 20 ft. or more. This is necessary for crane operators, jeep and truck drivers, and railroaders, for example.

**Field of vision.** Ability to see to both sides, and up and down, while focusing on a small target.

**Depth perception.** Ability to judge space relationship. This is important for accuracy in almost any job. \* \* \*



● Just off the press is your FREE copy of the big new CESCO 48-page catalog. More than a catalog, this publication is a helpful guide for choosing the right safety protective equipment to meet your particular requirements. For example, there's a detailed chart listing the recommended safety equipment to use for 17 basic classifications of industrial hazards. And there's a complete description and illustration of all the items in the CESCO

line—for over 50 years the standard bearer of quality safety protective products built for maximum safety, comfort and durability.

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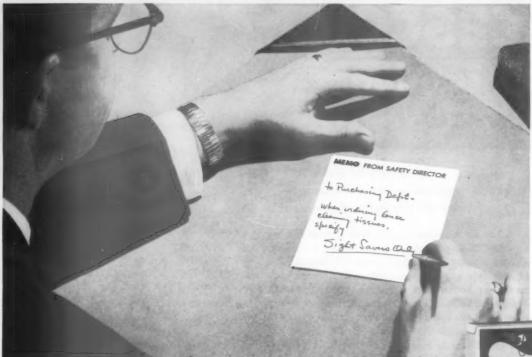
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CESCO

CHICAGO TYU SHIELD COMPANY

FACT:

# SIGHT



The same genuine SIGHT SAVERS bought by millions at drug counters are used by workers throughout 10,000 plants.

# FREE WALL DISPENSERS!

\$2.50 value each . . . free with your purchase and continued use of SIGHT SAVERS

- Strong, heavy-gauge steel . . . pilfer proof.
- No waste delivers just one tissue at a time.
- No mess no liquids, no bottles, no extras.
- · Never runs out can be refilled before empty.
- Easy to install compact, only 31/2" x 8" overall.
- · Attractive colors safety green, white or black.



# are preferred by safety directors in over 10,000 plants!

# Here's what THIS FACT means to your eye safety program

Thousands of safety directors, who have tried every method known for cleaning glasses, agree: SIGHT SAVERS are the most effective way to boost eye safety in the plant. You'll agree, too, once you compare genuine silicone-treated SIGHT SAVERS with any other lens cleaners. Safety directors report workers keep safety glasses on the eyes, not on the shelf, when SIGHT SAVER cleaning stations are close at hand. SIGHT SAVERS wipe away the best excuse ever given for not wearing safety glasses.

# More reasons why SIGHT SAVERS are your safest buy

- Treated on both sides with *twice* as much silicone as other tissues . . . do the best job of cleaning and polishing.
- Nationally advertised; known, preferred and purchased by millions of satisfied users. You don't have to "sell" workers on using SIGHT SAVERS . . . your employees are already pre-sold.
- Endorsed by leading opticians . . . meet Federal specification UU-P-313d for lens cleaning tissues.

NOW - new lower prices for SIGHT SAVERS...

check with your safety distributor

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

\* In Canada, any branch of The Safety Supply Company.

# **Respiratory Protection**

-From page 96

Bands should be replaced when the respirator is transferred to another employee.

The respirator should be turned in to the central station at the end of each shift to be cleaned and sterilized and repaired if necessary.

Where the maintenance crew works several shifts, one respirator per employee may be sufficient. Usually, however, it is necessary to have one complete unit in the process of cleaning while the other is being worn.

Filters should be replaced when clogged, and used ones discarded. Canisters should be replaced at regular intervals. Even when not in use they lose their effectiveness with time. \* \* \*

# Training in Use of Respiratory Equipment

Respirators are often used as emergency equipment under conditions of strain and excitement. Those who will have to use them should therefore be trained thoroughly.

Regular inspection is also necessary to avoid deterioration of



HOSE MASKS and life lines safeguard crews checking new gas service connection in manhole. Crank supplies air to men underground.

equipment which is not used regularly.

Training

1. Train each person in putting mask on and adjusting it rapidly to his face.

2. Have each person wear it long enough to become accustomed to the breathing resistance and to putting it on and taking it off.

3. Repeat training at regular intervals.

### Maintenance

1. Set up a card for each mask to indicate date of latest inspection and replacement of canister and amount of use, if any, which canister has had.

2. Replace canister at least annually, even if not used.

3. When a canister is replaced, examine facepiece, harness, hose, and headbands for leaks or deterioration. Replace defective parts.

4. Canisters are ordinarily supplied with seals to keep out air while in storage. Remove seals when canister is placed in service.

Store mask in a place as cool and dry as possible and accessible to hazardous area.

6. If mask is for emergency use only, canister should be replaced after use. \* \*

# Safety Gear Saves Boilermaker 5 Times

Joe Kasper, 40 years a boiler maker at the Standard Oil Company's (Indiana) Casper, Wyo., refinery, is a walking testimonial for safety equipment. His unusual record is described in Standard Oil's employee magazine, *The Torch*, for January 1959.

If Joe hadn't used his hard hat, safety shoes, and goggles on and off the job, today he'd probably be totally blind and unable to walk properly.

Back in the days before hard hats, Joe was clipped twice by falling rivets. Medical treatment involved seven stitches, plus. When hard hats were issued, he was just about first in line . . . and glad to be there.

One day he climbed a 120-ft. tower and began to install a steel sheet. He had on his hard hat. A sudden blast of wind lifted the metal and swung it with crushing force

against his hat. He didn't suffer a scratch.

Another time, he was walking by a still that was being repaired. A falling chunk of steel knocked off his hard hat. Unharmed, he picked up his dented headgear and went on his way.

And he's had similar luck with safety-toe shoes. He was wearing this type of footwear one day, while he and two helpers put a 1000-lb. sheet of boiler steel in place. The sheet dropped, pinning one of Joe's feet.

His assistants rushed in with a jack and raised the plate. The shoe was ruined. And all that troubled Joe was a slight bruise over the arch of his foot. (The two helpers scrambled to order safety shoes.)

Joe is also indebted to safety goggles. Once, he and a fellow worker were shaping a power box for a still. Just as the helper was about to hit the chisel, Joe remembered about wearing safety goggles. He halted work and put them on. Then at his signal the other man swung. A piece of metal smashed the goggles' right lens. But the eye was unhurt.

Even off the job Joe's safety gear has earned him continued eyesight. On a building project he grabbed a heavy hammer and attacked a concrete partition. A piece of rock shattered the left lens of his safety goggles.

At times Joe has had a dented hard hat, crushed shoes, and smashed goggles—but he's satisfied.



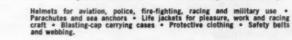
CLEAN, sterilized respirators should be available where there is a possibility of a contaminated atmosphere. (Mine Safety Appliances Co.)



denerally, a salute is hats off. But a salute to industrial safety directors must be hats on — because safety directors have saved untold hours of working time, and prevented thousands of serious accidents, — by insisting that their men keep their hats — hard hats — on!

With a GENTEX, there's no problem getting your men to keep their hats on — men like to wear it because it's lightweight, comfortable, attractive and fits right. And it's safer, too — GENTEX research-for-safety is dedicated to making the work of the Safety Director ever more effective.







LEADING SUPPLIER OF HELMETS TO THE ARMED SERVICES

CORPORATION Dept. T-1 450

Dept. T-1 450 Seventh Ave., New York 1, N. Y.

Please write for specifications and test equipment.

Circle Item No. 71-Reader Service Card

# THE SAFETY LIBRARY



Books, pamphlets and periodical articles of interest to safety men . . . Compiled by the Library, National Safety Council

# Handbook of Industrial Loss Prevention.

Handbook of Industrial Loss Prevention. By Factory Mutual Engineering Division. McGraw-Hill Book Company, Inc.. 327 W. 41st St., New York 36. 1959. 864 pp. \$20.

FOR THE SAFETY engineer charged with dual responsibility of accident prevention and fire prevention, this book should prove particularly valuable. Originally, the practices contained in this book were developed for loss prevention engineers of the Associated Factory Mutual Insurance Companies.

Although some information in this new volume has been available in bulletins, this is the first time it has all been brought together in one convenient form for safety and fire protection engineers. This book contains much new and revised material never before available, except to Mutual Insurance Company engineers.

The material is written in an easy-to-understand style, which has been one of the virtues of the previously published bulletins. Since this book serves as a guide in planning for safety against fire, explosion, and wind, it should serve as a most valuable reference to safety engineers. As this material is based on the experiences of eight insurance companies during more than 120 years, one can feel certain the 6 pp. data has been time-tested and is accurate. In addition to the information gained through loss experience. much other material has been added through large-scale fire tests and other research.

ROY BENSON

# **Agricultural Chemicals**

Hanna's Handbook of Agricultural Chemicals, Second Edition. Available from the author, Lester W. Hanna, Route 1, Box 210, Forest Grove, Ore. 450 pp. \$5.95.

THIS VOLUME contains descriptions of more than 1,000 commer-

cial chemicals and miscellaneous items used in the agricultural industry.

Mr. Hanna, a research entomologist and agricultural technician, has listed the common and chemical names and numerical designations of fertilizers, fumigants, fungicides, weed killers, insecticides, livestock chemicals, rodenticides, and miscellaneous materials. In addition, there is a brief listing of their chemical and physical properties, formulations and uses, toxicity, and antidotes in case of poisoning.

Other features include Food and Drug Administration residue tolerances, chemical compatibility and weather charts, an excellent quickreference spray compatibility chart, and safety practices.

E. L. ALPAUGH

# BOOKS AND PAMPHLETS

### Health

Understanding Medical Terminology. Sister Mary Agnes Clare Frenay. 1958. 202 pp. The Catholic Hospital Association, St. Louis 4, Mo.

### Marine Industry

Safety Programs for Port Organizations. Permanent Technical Committee on Ports, Inter-American Economic and Social Council, Organization of American States. Pan American Union, Washington, D. C. 1958.

Proceedings. Permanent Technical Committee on Ports. First Meeting, Washington, D. C., March 24-28, 1958. Council, Inter-American Economic and Social Council, Organization of American States. Pan American Union, Washington, D.C. 1958. 102 pp.

### Mines

Lode-Tin Mining at Lost River, Seward Peninsula, Alaska. 76 pp. 1958. U. S. Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. Information Circular 7871.

# **Nuclear Explosions**

Technical Information Bulletin on Atomic Weapon Accident Hazards, Precautions and Procedures. September 30, 1958. U. S. Atomic Energy Commission, Safety and Fire Protection Branch, Washington 25, D. C.

### MAGAZINE ARTICLES

### Accidents

"Accidents Cost Mechanical Contractors \$10 million in '58—Compensation Insurance Costs \$7 Million." Mechanical Contractor. December 1958. pp. 31-33.

"Management of Trauma in Relation to Permanent Disability." Earl D. McBride. Journal of Occupational Medicine. January 1959. pp. 21-26.

Medicine. January 1959. pp. 21-26. "Whiplash." N. Gillmor Long. Industrial Medicine and Surgery. January 1959. p. 11. (A discussion of the misuse of the term "whiplash injury.")

### Aeronautics

"Applicator Accidents Report Shows Decline." Agricultural Chemicals. January 1959. p. 50.

"Ramp System Designed as Jet Age Aid." Craig Lewis. Aviation Week. December 29, 1958, p. 35.

# **Atomic Energy**

"AEC Safety Research Program— Reactor Design Factors." Howard G. Hembree. *Industrial and Engineering Chemistry*. January 1959. pp. 85A-87A.

### Chemicals

"Labeling Requirements for Toxic Substances." Hervey B. Elkins. AMA Archives of Industrial Health. December 1958. pp. 451-456. (The governmental industrial hygienists' viewpoint.)

### Construction

"Safety in Plant Construction." J. A. De Luca. *Industrial and Engineering Chemistry*. January 1959, pp. 97A-98A.

"Safety Program Registers Gains in 1958; Frequency of Accidents Is Down but Severity Increases." *The Constructor*. January 1959, p. 46.

"Work-Injury Rates Drop in Contract Construction." *The Constructor*. January 1959. p. 46.

### Electricity

"How to Avoid Fuse Troubles." National Engineer. January 1959. pp. 22-23.

-To page 168

# SAFETY GOGGLES | SAFETY SPECTACLES

# FORM FITTING COMFORTABLE



# LIGHTWEIGHT EASY TO WEAR

Model 4405V Methacrylate Lens Model 4415V Acetate Lens



Soft Vinyl Frame

'Stac-Vent'' - a new principle in goggle ventilation. Clearer Vision . . . More Comfort . . Greater Safety. Large frame fits comfortably over all prescription glasses. Lenses optically correct - shotterproof - easily replaced. Also available with regular or screen ventilation.



Shatterproof, optically correct lenses. Easily replaced . . . snap-in, snap-out. In clear, light, medium or dark green. One size and model fits every worker.

Wearer adjusts and maintains his own spectacles. WORN BECAUSE THEY ARE COMFORTABLE

Model 422

Model 80



**Soft Vinyl Frame** 50 mm Round **Hardened Safety Glass Lenses** 

Maximum protection where there is extreme abrasion. Maximum comfort and minimum weight. Large size, fits over all prescription glasses.





**New Over-Eves** Protection

Almost 100% protection, plus all the comfort of "Tuc-Away" "Visor-Tuc"

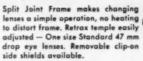
fits snugly against the forehead. Shatterproof Eye Savers lenses interchangeable in Tuc-Away Model.



**Welding Goggle Opaque Black Soft Vinyl Frame** 

Furnished with replaceable 50 mm round, Federal Spe-cification, filter lens shades 3, 4, 5 or 6, protected inside and out by cover lenses.

# **Split Joint**





ck, easy replacement of: PLASTIC SAFETY LENSES PRESCRIPTION LENSES PLANG SAFETY GLASS LENSES



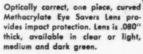
Model 99



Cheepee One-Piece Goggles

Close fitting, lightweight, comfortable. Optically correct . . . no distortion. Available in clear or medium green.

# Methaspec **Eve Shield**





For details, see your Authorized Eye Savers Supplier or write direct

**Quality Eye Protective Equipment** 

Made by the Leaders in Plastics



WATCHEMOKET OPTICAL CO., INC.

232 West Exchange St., Providence 3, R. I. • In Canada: Levitt-Safety Limited, Toronto 10, Montreal 26, Winnipeg

# COMING



in safety and related fields

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Thirty-eighth Annual Massachusetts Safety Conference and Exhibit. (Hotel Statler Hilton.) Bruce Campbell, manager, Massachusetts Safety Council, 54 Devonshire St., Boston, 9, Mass.

### Mar. 17-18, Fort Wayne, Ind.

1959 Northeastern Indiana Safety Conference and Exhibit. Ivan A. Martin, manager, Safety Council, Chamber of Commerce of Fort Wayne, Fort Wayne, Ind.

### Mar. 22-25, Houston, Tex.

Annual Texas Safety Association Conference. (Rice Hotel.) J. O. Musick, general manager, Texas Safety Association, Inc., 830 Littlefield Building, Austin, Tex.

### Mar. 23-25, Los Angeles

Sixth Annual Western Safety Congress and Exhibits. (Ambassador Hotel.) Joseph M. Kaplan, secretary-manager, Greater Los Angeles Chapter of the National Safety Council, 3388 W. 8th St., Los Angeles 5.

### April 5-9, Cleveland, Ohio.

1959 Nuclear Congress. (Cleveland Auditorium.) Engineers Joint Council, 29 W. 39th St., New York.

### April 6-7, Toronto, Canada.

Annual Conference of the Industrial Accident Prevention Associations. (Royal York Hotel.) R.G.D. Anderson, general manager, Industrial Accident Prevention Associations, 90 Harbour Street, Toronto 1, Ont.

# April 6-10, Cleveland, Ohio.

1959 Atom Fair, H. F. Grebe, exhibits manager, International Atomic Exposition, Architects Bldg., Philadelphia 3.

# April 7-8, Berkeley-Oakland, Calif.

Seventh Annual Northern California Safety Congress. (Hotel Claremont.) Eastbay Chapter, National Safety Council, 1322 Webster St., Oakland 12, Calif.

### April 8-10, Gainesville, Fla.

Sixth Annual Conference on Accident Prevention Engineering. (University of Florida.) Donald B. Wilcox, conference coordinator, University of Florida, Gainesville, Fla.

# April 9-10, Kansas City, Mo.

Fourteenth Annual Central States Safety Congress. (Hotel President.) George M. Burns, managing director, Kansas City Safety Council, 419 Dwight Building, Kansas City, Mo.

## April 13-17, New York

Twenty-ninth Annual Safety Convention and Exposition. (Hotel Statler.) Paul F. Stricker, executive vice president, Greater New York Safety Council, 60 E. 42nd St., New York 17.

### April 14-16, Pittsburgh, Pa.

Thirty-fourth Annual Western Pennsylvania Safety Engineering Conference and Exhibit. (Penn Sheraton Hotel.) Harry H. Brainerd, executive manager, Western Pennsylvania Safety Council, 605 Park Bldg., Pittsburgh, Pa.

## April 20-22, Syracuse, N. Y.

Sixth Biennial Central New York Safety Conference and Exposition. (Hotel Syracuse.) Newell C. Townsend, administrative secretary, 351 South Warren Street, Syracuse 2.

### April 22-23, Indianapolis, Ind.

Twelfth Central Indiana Safety Conference & Exhibit. (Claypool Hotel.) Jack E. Gunnell, director, Safety Council, Indianapolis Chamber of Commerce, 320 N. Meridian St., Indianapolis 11, Ind.

# April 23-25, Portland, Ore.

Twenty-fifth Annual Forest Products Safety Conference. (Multnomah Hotel.) Pat Reiten, chairman, Forest Products Safety Conference, 2301 N. Columbia Blvd., Portland, Ore.

### April 28-30, Columbus, Ohio.

Twenty-ninth All-Ohio Safety Congress and Exhibit. (Deshler-Hilton Hotel.) Arthur W. Moon, congress manager, Room 611, Ohio Departments Building, Columbus 15.

# April 29-30, Cleveland, Ohio

Symposium on packaging and transportation of chemical products. Cleveland Engineering and Scientific Center. Manufacturing Chemists' Association, Inc., 1625 Eye St. NW, Washington 6, D. C.

# May 4-6, Allentown, Bethlehem, Easton, Pa.

Thirty-second Annual Eastern Pennsylvania Safety Conference. Harold A. Seward, secretary-treasurer, Lehigh Valley Safety Council, 602 E. Third St., Bethlehem, Pa.

## May 5-7, Niagara Falls, N. Y.

Nineteenth Western New York Safety Conference. (Hotel Niagara.) Clifford H. Seymour, executive secretary, Western New York Safety Conference, P.O. Box 315, Niagara Falls, N. Y.

### May 7-8, Seattle, Wash.

Third Annual Northwest Industrial Safety Conference. (Olympic Hotel.) William A. Feathers, Seattle-King County Safety Council, 304 Spring St., Seattle 4, Wash.

# May 10-12, Baton Rouge, La.

Third Annual Industrial Mutual Aid Conference and Exhibit. (Bellemont Motor Hotel.) Contact Chief R. A. Bogan, chairman, Baton Rouge Mutual Aid System, Central Fire Station, P. O. Box 96, Baton Rouge, La.

## May 12-14, Rochester, N.Y.

Second Triennial Genesee Valley Safety Conference and Exposition. (Manger Hotel.) William H. Keeler, secretary-treasurer, Genesee Valley Safety Conference, Inc., 55 St. Paul St., Rochster 4, N. Y.

### May 18-19, Memphis, Tenn.

Ninth Annual Convention of National Water Safety Congress. Herbert E. Hudson, president, National Water Safety Congress, 314 Canterbury Dr., Knoxville, Tenn.

# May 19-20, Philadelphia.

Executive Committee, Public Utility Section, National Safety Council. (Ben Franklin Hotel.) Paul Windsor, Bureau of Safety, 20 N. Wacker Dr., Chicago 6.

### May 21-22, Duluth, Minn.

Thirty-fifth Annual Conference of Lake Superior Mines Safety Council. (Hotel Duluth.) Allen D. Look, secretary, Lake Superior Mines Safety Council, 321 Federal Bldg., Duluth 2, Minn.

# July 29-30, Brisbane, Australia.

1959 National Industrial Safety Convention and Exhibition. (City Hall.) J. E. McDonnell, secretary, National Industrial Safety Convention and Exhibition, PO Box 27, Brisbane-North Quay, Queensland, Australia.

Life Guard hat SH-3, the all-purpose hat for construction and electrical uses.



Fiber Glass hat SH-1, meets the tests for construction workers' safety hats.

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Face Shield F-1, firmly held on Safety Hat SH-1 by elastic band

TYPE 'F-1'



Visors 151/2 by 9" deep in clear plastic, tints of green.



Visor with welding lens (shown on Musketeer)



Visor 15½ by 9" deep of 24-mesh wire screen.

# ALL JACKSON FACE SHIELD VISORS FIT FACE SHIELD 'F-1' (left) and 'MUSKETEER' (below)







♠ Face shield J-1 shows 6" clear visor.

Metal-bound visors type J-1, 111/4" wide, 8", 6" and 4" deep; in clear plastic, .020", .030" and .040" thick, and in tints of green, .020" only.



Life Guard Cap SC-3, like the SH-3 hat, is made in white, yellow and grey



Two pivoted aluminum frame members permit raising visor.

Cap-and-helmet SCH-1P shows curved shell helmet on SC-2 safety cap.



Cap-and-Goggle shows goggle unit CW-70 pivoted on SC-2 safety cap.



Musketeer Assembly No. 82 on Life Guard Cap SC-4 shows 34-2 visor, medium green,

with

'MUSKETEER'

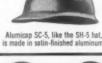
FACE SHIELD

# ALL JACKSON combine



Fiber Glass Cap SC-1, like the SH-1 hat, is made in grey and seven other colors.







'Winterizers' (left) may be used with all Jackson products shown here. Arc welding handshields (right) are available in all helmet shell styles, plastic lens holders.



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Curved shell helmet H1-AP



Narrow shell helmet H3-A shows metal lens holder.



Straight shell helmet H9-A shows plastic lift-front.

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Supergoggles WR-70 for welding and GR-70 for grinding; elastic headbands





Goggles WR-50 for welding and GR-50 for grinding. Also in headrest types.



Musketeer Headgear Assembly 70-S shows Adjust-0-Lok, sperk deflector, and clear visor No. 34-4, .040" thick.



Welding goggle type BX has plastic headrest and 2 by 4\%" filter lens.

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# The Women in Your Plant

# How to keep them safe, healthy, and happy on the job

NATIONAL Manpower Council statistics show that at least 9 of 10 American women are likely to work outside the home during their lives. One-third of all U. S. women aged 14 and older are currently in the nation's labor force.

Today's schoolgirls may expect to spend as much as 25 years or more in paid work outside the home. And two of every five mothers with school-age children

are in the labor force.

These figures indicate the strength in numbers and importance of women in U. S. industry. And, as part of this country's labor force, women have relatively the same safety needs and obligations as their male counterparts.

Most women are found to excel in routine, repetitive operations and work needing finger or hand skill, assembling small parts, inspecting, packing, work requiring alertness and care, or the use of light instru-

A firm's medical department should know job requirements such as these to find whether a woman applicant has the physical and mental qualifications. Factors involve:

- 1. Skill and knowledge required.
- 2. Physical exertion necessary.
- 3. Operation hazards, exposure to moving machinery.
- Amount of sitting and standing.
   Contacts with toxic dusts, fumes, gases and odors.
- 6. Finger dexterity, vision, whether working alone or with others.

To help industry in its job placement of women the Women's Bureau of the U. S. Department of Labor has assembled and made data available. State regulations concerning working women are available from state labor departments.

## **Work Garments**

Special Clothing is required by women to reduce fatigue, to improve morale, and to keep the product clean. Primarily, special garments are needed to protect them from being caught in moving machinery; from the hazards of dusts,

gases, fumes, or acids; from flammable materials; from flying and dropped objects; from material on floors; and from ordinary dust and dirt.

Women need the same safety features in protective clothing and equipment as men, but appearance is especially important to female employees.

Educational Campaigns, exhibits of uniforms, head coverings, and other safe clothing will help. Suppliers recognize women's awareness of style and offer clothing and equipment to meet this need.

Clothing for women should be comfortable in any temperature, appropriate for the job, and attractive. Suitable dresses, uniforms and smocks are available. Where skirts are a hazard, slacks and coveralls are used. Fit of the garment is important, since tight-fitting clothing will cause strain, increase fatigue and hamper movement.

Outer garments should avoid loose sleeves, tails, full skirts, flounces, ties, lapels and cuffs. No loose-fitting open sweaters should be worn. Jewelry also can be a danger.

Head and Hair Protection. Caps with stiff visors, hair nets, and ventilated turbans are available to protect hair from catching in moving belts, spindles, and other moving machinery and equipment.

Paper caps are used in food plants to protect the hair and scalp from dust or to keep foreign material out of the product. These caps are usualy provided by management and are changed frequently.

Hand and Arm Protection. Gloves should fit snugly under the sleeves and should not be awkward to handle. Sleeves should reach from the wrist to the armpit and should be fastened at both ends. They should fit over the gloves and should be roomy enough to allow for flexing the elbows without sliding up and down the arm.

Aprons should be full and should cover the front of the body from

well below the knee to the neck. They should be fastened around the neck and waist without loose ends.

Shoes. Women's work shoes should be adequate in weight, comfortable and well-fitting—and equipped with steel toes where hazards so indicate. They should have low or medium heels—no open toes or sling-back heels. High heels on the job should be discouraged, since women usually are more susceptible to falls than men. Shoes should provide proper support.

Stockings. Right size reduces pressure and fatigue. Cotton stockings are required in certain hazardous locations, such as hospital operating rooms, where synthetic textiles may cause static sparks.

### Sanitation

Sanitary Facilities. Clean, adequate toilet facilities are important, as are properly equipped rest rooms, locker rooms and showers. Good seating facilities, couches, and mirrors should be provided.

Work and Pregnancy. Pregnant women should not be employed in jobs involving heavy lifting or other heavy work or in jobs that require continuous standing and moving. Other work taboos for pregnant women include occupations requiring a good sense of bodily balance (work on scaffolds or stepladders), and operation of power-driven machines having a point-of-operation hazard.

Evidence indicates non-pregnant women are no more susceptible than men to industrial poisons. But some toxic substances are considered extra hazardous during pregnancy.

The Women's Bureau of the U.S. Department of Labor offers these recommendations for successful placement of women in industry:

- Survey jobs to find those suitable for women.
- Adapt jobs to fit womens' smaller body frames and lesser physical strength. (About 60 per cent the strength of men.)
- Provide service facilities to accommodate the anticipated number of women.
- If the number of women employed justifies it, appoint a woman personnel director and the

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head of a womens' counselor system.

- Develop a program for induction and training.
- Maintain safe, healthful, pleasant working conditions.
- 7. Give women equal opportunity with men.

Where conditions and equipment can be adjusted to make a woman worker's job safer and more productive, do so.

- Guards should be set close enough that the woman's smaller hands cannot enter the openings.
- Height of benches, distances away from piece parts, and foot pedals or hand controls should be reset to conform to the generally shorter stature and reach of women.
- Extensions of levers on machines, tools, and equipment to produce the same force with less effort.
- 4. Use of lighter, longer wrenches to reduce strain on operators.
- Suspension and counterbalancing of heavy hand tools where substitution of lighter tools is impractical.

Seating is important, especially in arranging to have workers alternate sitting and standing. This procedure—where muscular work is involved—has resulted in increasing output from 2 to 13 per cent.

# Lightning Strikes More Than Once

Records of multiple accidents to wearers of industrial safety eyewear, reported to the National Society for the Prevention of Blindness, prove lightning can strike twice.

An industrial worker who relaxes precautions because of a fortunate escape from injury may find himself involved in a similar accident within a week, or even the same day. Circumstances may be almost identical.

A grinder at Northern Electric Company had his forehead lacerated when a large emery belt broke. It slashed across his face, striking his safety lenses, but he was able to return to work the next day with a new pair of safety glasses. Within a few hours an identical accident

occurred. In both instances safety eyeware prevented any damage to his eyes.

An employee of Sperry Gyroscope has twice had his vision saved, when molten metal splashed over his glasses.

A metal cleaner at Electro Metallurgical Company had his left safety lens smashed by a metal chip. The following month, his right lens was damaged under the same circumstances. Neither accident resulted in an eye injury.

Last year about 300,000 eye injuries were suffered by industrial workers. Adequate eye protection equipment could have prevented at least 90 per cent of them, according to the Wise Owl Club of America, a nationwide eye-safety incentive program.

Each of the more than 15,000 members of the club has saved the sight of at least one eye by wearing safety eyewear at the time of an accident during working hours. The Wise Owl Club is sponsored by the National Society for the Prevention of Blindness.



gards, in a wide variety of flattering colors, are tailored to today's women. Modern styling of mesh Hairgards match good looks with safety. Solid cap styles are popular for protection against dust, oil mist and possible scalp infection. Snood models, in either mesh or solid material, are designed for long hair styles.

Fashion designed StaSafe Hair-

Hairgards are also available with your slogan or emblem printed in one contrasting color. Helps make your safety program a morale builder. Strengthens pride in department, work, company and safety record.

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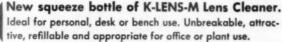
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# Disaster Plans

-From page 10

ens, police, firemen, engineering and rescue workers. Contact the local CD group about the possibility of special training courses.

Floor plan. Make a floor plan showing branch control rooms, first-aid stations or cabinets, fire extinguishers and other equipment, elevators, stairs, emergency lights and exits, and a general traffic plan.

Put up directional and information signs, including evacuation instructions, in offices and other places where plant personnel meet.

Make arrangements for emergency supplies in shelter locations: first-aid kits, water supplies, and emergency lighting. Be sure that emergency personnel have proper identification — arm bands, hats, special clothing or other gear.

Exit drills. Hold exit drills often, and be certain all employees participate. Announce the first few drills ahead of time, but after routine has been established, hold these drills at irregular intervals without warning. Check for weak points in coordination and communication that can be ironed out in post-mortem sessions after each drill.

The head of each protective service is logically responsible for the training of his workers. In planning a training schedule, he should cooperate with municipal departments and with the local civil defense organization for effective results.

Double training. Where possible, a person trained in one service should be instructed in other services. This versatility might enable a worker trained in rescue techniques, for example, to fight fires.

Teams of protective-services men should be trained to cooperate closely with teams of other protective services. Conditions of training should be as near to actual disaster conditions as possible.

Protective-service teams might engage in training exercises with local civil defense organizations.

# Wire from Washington —From page 6

3913 would require that in the formulation of a national airport plan, consideration be given to the desirability of promoting safety by minimizing interference between civilian and military air operations.

The Federal Aviation Agency placed temporary bad-weatherlanding restrictions on the newlyused plane involved in the accident that set off the flurry of activity.

The Air Force and the Atomic Energy Commission announced the formation of a Life Sciences Working Group for their jointly operated Aircraft Nuclear Propulsion Office. This group will assist in defining the human-factors problem associated with nuclear propulsion for aircraft and missiles, and will meet semi-annually to examine in detail the health and safety characteristics of specific propulsion systems.

Traffic safety. The Roberts Special Subcommittee on Traffic Safety of the last Congress has not been reconstituted in the same form in



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- 4. In truck fleets and bus fleets the larger pieces of

SEECLOTH fogproof the windshield and prevent accidents. One fogproofing a week is usually sufficient to keep the windshield

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the present Congress. Instead, the House Committee on Interstate and Foreign Commerce created a standing Subcommittee on Health and Safety, with Congressman Roberts as its chairman.

Where last year's subcommittee dealt solely with highway traffic safety, the new subcommittee will have broadened jurisdiction. This is to include public health and quarantine, food and drugs, hospital construction grants, and safety (including highway safety, air safety, and air pollution). Also, unlike the situation in the last Congress, the new subcommittee will not have its own special staff, according to present plans.

The President's Traffic Safety Committee reported to the Chief Executive, who also accepted the resignation of Harlow H. Curtice from the committee's chairmanship and appointed William Randolph Hearst, Jr., as the new chairman.

Air pollution control continued to be of major federal interest. In his budget, the President requested an additional 200,000 dollar appropriation to the U. S. Public Health Service for expanded research activities related to automotive exhaust studies.

S. 441 (Kuchel, Engel and Clark) would extend the life of the Federal Air Pollution Control Act, under which the federal government has spent some \$12,333,000 in the past five years.

"Scientists generally concur," said Senator Kuchel, "that the principal source of fumes which are ingredients of smog and pollution in most cities is the motor vehicle." HR 2347 and HR 3183 are companion bills in the House.

The President's budget included increased funds for the Interstate Commerce Commission to provide for a larger number of safety surveys of motor carrier operations, although the President anticipated only 11,000 unsafe motor vehicles would be ordered out of service, as compared with 13,951 in fiscal year 1958.

The I.C.C., in a motor carrier in-

vestigation report, deplored the "numerous accidents involving collision of commercial vehicles, especially buses, with the rear of more slowly moving or stopped vehicles," a number running "counter to expectations for improved safety where modern vehicles and highways are concerned."

The I.C.C, called on motor carrier and government officials to investigate such accidents "and explore all physical and psychological factors" regarding the drivers, vehicles, and highways.

Industrial safety. S. 743 (Clark and eight other senators) would amend the Federal Coal Mine Safety Act to remove the exemption on certain mines employing no more than 14 employees. HR 1098 (Bailey), and other identical bills, are the companion bills.

Senator Clark stated that the rate of fatalities in exempt small mines is 2½ times that of larger mines. As compared to total mine fatalities, the percentage of fatal acci-



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National Safety News, March, 1959

dents in exempted mines shows a steady increase in the past four years, he said.

Although mines exempted from the Federal Coal Mine Safety Act produce only 7 to 8 per cent of the nation's total tonnage, they had 29 per cent of all coal mine fatalities in 1958, according to preliminary figures.

S. 811 (Murray and eight other senators) would provide for inspections and investigations in metallic

and non-metallic mines and quarries (other than coal mines) to obtain information relating to health and safety conditions, accidents, and occupational diseases. HR 3741 (Metcalf) and HR 3760 (Saylor) are similar in purpose.

A Federal Court of Appeals affirmed a District Court ruling (See "Wire," May 1958) that the Federal Coal Mine Safety Act required mines to be classified as "gassy," thus calling for special precautions,

whether the methane found in the mine was generated from mining coal or had escaped into the coal mine from an adjacent gas well.

The court said the history of coal mine disasters which led to enactment of the Safety Act prevented a narrow or limited interpretation of that law.

HR 3286 (Daddario) seeks to amend the Natural Gas Act to authorize the Federal Power Commission to prescribe safety requirements for natural gas companies.

A subcommittee of the Joint Atomic Energy Committee concluded hearings on the safety methods of disposing of atomic waste through dispersal in the air, or in water, burying it, or storing it underground in tanks. HR 4103 (Vinson) and HR 4148 (Brooks) would authorize the Defense Department to indemnify its contractors against nuclear and other unusual hazardous risks, and limit the liability of contractors so indemnified.

The International Atomic Energy Agency has set up a panel of experts to study and make recommendations regarding the legal liability to the public of those engaging in the construction, supply, and operation of nuclear reactors.

The President's budget requests augmented funds for the ICC to provide an increased number of inspections of railroad safety appliances and locomotives. And the ICC issued revised interpretations of certain rules and instructions for the inspection and testing of nonsteam locomotives.

S. 995 (Magnuson and 18 other senators) would amend the Interstate Commerce Act to protect railroad employees by regulating the use of track motor cars. S. 996 (Magnuson plus 19 other senators) is designed, according to its sponsors, to promote safety of employees and travelers on railroads by requiring such carriers to maintain tracks, bridges, roadbeds and permanent structures for the support of way, trackage, and traffic in safe and suitable condition.

In his budget the President also provided for "substantial increases" to the Atomic Energy Commission to develop improved fuel elements, reactor systems, and reactor safety.



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# Diary

-From page 7

assistant's protective equipment.

Each of us had the basic minimum of equipment, of course—oxford-type safety shoes, goggles (mine are prescription ground), and hard hat. We have a gas mask with a general-purpose canister. We have one air-line respirator. I personally own a pair of good lineman's rubber gloves—but neither of my boys has a thing to use in the presence of electrical hazard.

All this equipment is in fairly good shape—though the gas mask canister is pretty old. But it struck me that, considering we safety engineers are exposed to almost every hazard in the project, there are some missing items.

We all go into foundries, but there isn't a foundryman's shoe in our equipment. There are several toxic vapor hazards against which our masks offer inadequate protection, and the air-line respirator is so much trouble to haul around that we've never had it out of its shipping carton except to check it over when it was bought.

Maybe a safety department doesn't need special equipment. Maybe all we need is the basic personal stuff, adapted to general conditions. Maybe we can assume that in special circumstances we can draw special equipment like masks and fire-resistant clothing and specialized gloves and footwear (we haven't a pair of shoes approved for use where serious electrical hazard is present). Maybe some of these things would only be useful in rescue situations, and maybe we should leave all that to the plant fire department anyway.

I don't know. I can't ask the boys to lug a trunk of stuff around with them, changing costumes to meet each shop's special hazards.

And yet, there seems something mighty ironic about a policy of letting the safety staff go around with equipment that does not come up to standard.

I wonder what other safety departments do about this question?

EDITOR'S NOTE: Letters from safety men, telling about their own policy on safety equipment for safety personnel, will be welcomed by NATIONAL SAFETY NEWS.



Circle Item No. 80-Reader Service Card







Circle Item No. 81-Reader Service Card

# Lighting

-From page 19

Seeing zones. Two zones in the work room must be considered in providing light.

The task zone is the job and its immediate surroundings. Work should be lighted adequately, shadows eliminated or diffused, and reflections from surrounding surfaces avoided.

The other zone is the rest of the room. A person looking up from work should not face glare from lighting fixtures or have to adapt to dark or glaring walls. Adapting eyes from light to darkness several hundred times a day is fatiguing.

If the surrounding area has a brightness at least one-third that of the task, visual conditions are reasonably good. Surroundings should never be appreciably brighter than the work zone.

Glare can be reduced by higher illumination levels throughout the room, also by finishing ceilings, walls, floors, and machines in light colors which reflect a high percentage of light. This reduces contrast between adjoining surfaces.

Directional and shadow effects are often desirable in general lighting. They accentuate the depth and form of solid objects. Clearly defined shadows are helpful in some operations, such as textile inspection. Harsh contrasts should be avoided.

Light levels for various operations will be found in many reference books. The most comprehensive work is the IES Lighting Handbook. Much useful information will also be found in manuals published by manufacturers of lamps and lighting equipment.

Existing levels are determined from readings with a light meter at points where light is needed. This device gives a direct reading of the number of footcandles.

General lighting is the minimum amount of light required for an area. This has been defined as uniform distribution of light to produce approximately equivalent seeing conditions throughout an interior.

Localized general lighting sources are usually arranged 10 ft. or more above the work. They should prevent too great a contrast in brightness between the more highly lighted work area and the adjacent areas, provide sufficient light for safety and for ordinary visual needs.

For general overhead lighting, levels range from 5 fc. for inactive storage and passageways to 1000 fc. for more exacting work, such as extra fine assembly.

Where higher levels are needed, supplementary units provide the necessary light.

Extra footcandles. To insure continued adequate levels, the system should be designed to give initially at least 25 per cent more light than the recommended minimum.

Where dirt collects rapidly and maintenance is difficult, the initial value should be 50 per cent above the minimum.

Supplementary lighting. Difficult seeing tasks require more light than can be obtained economically by overhead general lighting. For such work supplementary fixtures are used.

Two types of equipment meet most needs. One uses small concentrating projectors to increase the light on the work and provide directional quality.

Another type has large area with low brightness, such as fluorescent desk or bench lamps. These fixtures can provide either general lighting for a small area or extra light for critical work, such as inspection.

Supplementary lamps should be shielded, louvered, or mounted to prevent glare.

The mercury-fluorescent combination is effective in medium-high bays which are easy to service and free from excessive dirt. It is recommended that mercury supply 60 to 80 per cent of the total light. Fluorescent will soften glaring contrasts.

In high bays twin units for mercury and incandescent can be installed. The mercury provides 50 to 65 per cent of the light. This combination is simple to maintain, offers little surface for dirt accumulation. It provides instant relighting after power interruption, when mer-



# **EVERY head HAZARD!**



Safety-ribbed, heat treated aircraft-type aluminum for maximum rigidity, strength and toughness. Lightest weight! Anodized to reflect heat and to resist corrosion. Smartest appearance. World's most comfortable polyethylene suspension...an exclusive feature! Natural color or many others on special order. Ask for Bulletin 55.

For maximum protection, durability, economy, Rugged, clean, sterilizable, self-extinguishing, Meet Federal Specs. GGG-H-142B. Exceed Federal Specs. for insulation resistance. No dangerous metal parts. Smooth dome avoids impact concentrations. 9 standard "molded thru" colors including phosphorescent, for job coding. Ask for Bulletin 55.





Guards against high voltages, impact and penetration in high or low ambient temperatures. Meets all E.E.I. AP-1-1954 specifications. Smooth domes avoid impact concentrations. Exclusive polyethylene suspension gives maximum comfort. Yellow, White, Orange, Gray; other colors on special order. Ask for Bulletin 55.

Others tell us (so we don't need to be modest!) that these "Supers" with their exclusive suspension are the most comfortable, best looking and most economical that money can buy. All types of FIBRE-METAL safety and welding equipment are described in Catalog No. 26. Bulletin 55 covers hats and caps. Ask your Wolding &

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For Miners, tool SuperGlas with Lamp Bracket



CHESTER

**ETAL** Products Company

CANADA: Fibre-Metal (Canada) Limited, Toronto

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cury lamps take 5-8 minutes to relight.

Incandescent lamps offer low initial cost. No auxiliary equipment is needed and an incandescent system is easy to install, maintain and relamp. However, lower efficiency makes over-all lighting cost higher.

Incandescent provides a "point" source of light. It can be controlled more easily but is more likely to

produce glare and shadows. In industrial practice incandescent is becoming less popular for general lighting. It is used largely for specialized supplementary lighting.

Efficient operation requires frequent checking to prevent voltage variation. If circuit voltage is lower than rated lamp voltage, light output and watts decrease, though life lengthens. If voltage is higher, light output and watts increase but life is shortened.

Voltage variation should be held within 3 volts of rated lamp voltage for 110-125-v. lamps and within 6 volts for 220-250-v. lamps.

Reflectors. Many types of reflectors have been designed to conserve light and prevent glare. Consider these factors in choosing the lighting unit:

- 1. Distribution of light on the job.
- 2. Efficiency of light output.
- 3. Sturdiness of construction.
- 4. Adaptability if more light is needed.
- 5. Economy of cleaning and replacement.

Lamps with a reflecting surface inside the bulb are used where dust, fumes, and other conditions make maintenance difficult or costly. The reflecting surface is sealed against deterioration and light is diffused through the bottom of the lamp.

Reflectorized lamps are available in both filament and mercury vapor types.

# Natural Light

A plant may be designed to make full use of daylight or to depend largely or wholly on artificial light. The problem is primarily one of economics, taking into consideration the number of sunny days and the increased cost of construction to bring daylight into the plant.

Sawtooth roofs, oriented to avoid direct sunlight, offer the most effective way of daylighting a one-story building. Extra construction cost as compared with a flat roof, may amount to 20 per cent or more.

Side windows alone are unsatisfactory for lighting extensive areas.

Skylights are rather expensive to keep in repair and clean. In regions where hail storms are frequent, panes of acrylic plastic are more serviceable. These are said to transmit a maximum of diffused light and a minimum of heat.

Refracting and diffusing glass are helpful in subduing glare. They improve distribution of light, particularly to distant parts of the room.

Translucent coatings for windows on the sunny side of buildings also help in reducing glare.

Reflection of daylight from

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This popular respirator weighs less than 5 ounces, is easy to wear ... practically unbreakable. More than 40 sq. inches twin filter area. Check valves guard against re-breathing stale air. Free literature on request describing full line of models. Order sample today from your safety equipment supplier or write direct-\$3.00 postpaid.

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Respirators for Industry Since 189

TO THE SAFETY ENGINEER WHO DEMANDS INSIDE INFORMATION

# ABOUT GAS MASKS

WE CHALLENGE YOU TO BUY ONE OF EACH MANUFACTURER'S FACEPIECE. WEAR EACH AN HOUR AND GET THE REAL FACTS-FROM THE INSIDE.

ACME CM 601-10 FACEPIECE GIVES:

NO DISTORTION! Due to flat lenses!

LESS FOG! POSITIVELY! Patented Jet Air Valves direct ALL of the incoming air against the lenses.

WIDER VISION ANGLES! DEFINITELY! Upward—Fewer bumped heads.
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INVESTIGATE-WRITE

# ACME PROTECTION EQUIPMENT COMPANY

1209 KALAMAZOO STREET

SOUTH HAVEN, MICHIGAN

sources outside a building can often be utilized. Light colors for faces of structures, walls of courts, and sawtooth roofs are helpful. These surfaces should be kept clean and free from sources of glare.

Sudden transition from bright to dim areas in a plant is hazardous. While the pupil of the eye is adjusting itself to the dimmer light, there is a period of semiblindness. Gradations of light at the approaches to areas of different intensity will avoid this trouble.

Photoelectric cells can maintain an even level of light, turning on artificial lighting when illumination falls below a specified level.

# **Special Fixtures**

Where lighting equipment is required for special uses or subjected to abnormal conditions, many types of lamps and fixtures are available.

Glow lamps are used as signal, pilot and night lights. They are not practical for general illumination.

Shock-resisting lamps are constructed to withstand shocks and bumps. They are used chiefly with portable fixtures on extension cords. Where possible, the use of low-voltage (6-12 v.) can often improve lamp performance where shock is present.

Vibration lamps have a more flexible tungsten filament and special support. Since vibration and shock frequently occur together, testing both lamps will tell which gives longer service. Fluorescent and mercury vapor lamps are a good choice where shock or vibration is present.

Weather-resistant lamps are used for outdoor lighting in industrial plants, docks, arenas, etc. They stand exposure to rain, sleet and snow without cracking.

Explosion-resistant fixtures are used where dusts, gases, fumes and vapors may create a hazardous atmosphere. These are available for use with incandescent and mercury vapor lamps. For the latter, ballasts should be located outside the hazardous areas.

Infrared lamps, in types and sizes up to 5,000 watts, are used for baking, drying and heating, as well as for therapeutic use.

# Maintenance

Efficient lighting requires a systematic maintenance program. Equipment may meet all requirements when installed but dust and grime immediately start reducing light output.

The first step in a maintenance schedule is to check illumination periodically with a light meter. When light drops to 75 per cent of its original value, lamps and reflectors should be washed with warm water and a detergent containing no free alkali.

Group replacement of lamps—both filament and fluorescent—is often practicable and desirable. The saving in cost of replacing a large number of lamps at one time is greater than the value of the remaining light output of the lamps. Point of replacement is usually 60 to 80 per cent of the rated lamp life.

Disconnecting hangers permit lowering fixtures to the ground or



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# NO-FOG

Write for Complete Catalog

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Use Just Water, No Chemicals Needed

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Tissues can be used several times.

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### REFLECTANCE VALUES

Reflector Factor (	
Ceilings	80
Walls	60
Desks and bench tops	35
Machines and equipment25	to 30
Floornot less than	15

floor for cleaning, relamping and repairs. Much climbing is eliminated.

# **Outdoor Lighting**

Outdoor lighting for night work or to detect trespassers is required by many industrial plants. Where work is done outdoors after dark, levels must be higher than those needed chiefly for plant guards to spot intruders and detect unusual activities and conditions.

Light sources should be shielded and aimed so that the area can be seen clearly. Light can be directed to form a "glare barrage" in the direction from which intruders might approach the plant.

# **Emergency Lighting**

Where power failure would endanger life, an emergency lighting system should be provided. It should be independent of the general lighting system. Exit, corridor, platform, wharf, and other locations should be included in the system so that persons could find their way out of a building.

Approved automatic devices should be installed to transfer the lighting load from general to emergency circuits in case of trouble.

Portable systems. For such emergencies as fire, explosion, accidents, or mobs, emergency lighting systems are helpful in rescue work and maintaining order. Portable wide and narrow beam floodlights with long extension cords can be used near power sources. For remote locations a power unit mounted on a truck is needed.

# Standards

To protect the buyer, the RLM Standards Institute provides recognized minimum standards of quality in lighting equipment. Equipment bearing the RLM label meets the Institute's requirements.



When a worker has to stop frequently to mop his forehead and wipe his glasses, his production efficiency has to drop.

That's where Koolpads come in. Every lightweight, cellulose sponge Koolpad holds six times its own weight in perspiration! Production delays to moop foreheads and wipe glasses are cut to an absolute minimum. In addition, a Koolpad dampened slightly in water before wearing gives a refreshing "lift" that helps shrug off some of the effects of stifling heat.... the immediate result is often improved production.

Each Koolpad is packed in a clean, neat envelope as an extra sanitary precaution. Also, every Koolpad has an easily adjustable elastic headband for a comfortable fit.

Insist on Koolpads, the sweatband with all these features... and the sweatband that can be rinsed in seconds and used over and over again.

# STANDARD SAFETY EQUIPMENT COMPANY

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NEWARK 4, N.J. CLEVELAND 10, OHIO LOS ANGELES 66, CALIF.



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999999

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6

PARTS OF THE BODY below the neck are exposed to numerous hazards: flying objects, crushing blows, heat and cold, radiation, cuts from sharp edges, and splashes of corrosive materials.

Fingers, for example, get into more danger than most parts of the body but can't be shielded by rigid armor against crushing or cutting from hand or power tools. However, gloves, mittens, and hand pads are preventing many abrasions, scratches, burns, and minor cuts.

Fire-resistant garments enable man to survive amid high temperatures. Less spectacular but more generally useful are modern work clothes, designed with safety in mind and made of natural and synthetic fabrics which withstand the exposures of the job.

STATISTICAL SOCIAL STATISTICS OF THE STATISTICS When it comes to protecting feet, safety is much easier. Shoes with steel toe boxes have shielded toes from many a crippling blow, without affecting the

# A Single Garment Or a Whole Outfit

You'll find the apparel you need for every occupational exposure



HATS, CAPS HELMETS



Acids & Alkelis Slips & Felis Felling Objects

> Ashustos Plestic-Rubber Cotton-Wool Metal



COATS, APRONS WAIST PROTECTION



Asbustus
Chrome Leather
Plastic
Rishber
Canvas-Fiber
Chemical Resistant
Reflective Fabric



SLEEVES

1	2	3	4	5	6	7	8	9	10	11	12	13	14
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X	X		X					X		X			
X	X	X						×					×
			X	×	×						×		
			×	×	×				×		×		
					X								
			×										

Asbestos
Chrome Leather
Flameproofed Duck
Plastic
Eukher
Chemical Resistant
Reflective Fabric



GLOVES, MITTENS HAND PADS FINGER GUARDS

1	2	3	4	5	6	7	8	9	10	11	12	13	14
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X	×		×					×		X			
			X	×	×				×		×		
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										X			

Asbestos Chrome Leather Rubber Plastic-Rubber Coated Fobric Matai Mesh Cotton-Canvas



PANTS, KNEE PADS LEGGINGS

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			X	×	X						X		
			×	×	×				X		×		
					X								
			×										

Asbestos
Chrome Leather
Flameproofed Duck
Fiber-Metal
Plastic
Kubber
Chemical Resistant
Reflective Fabric



SHOES, BOOTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14
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	×	X	×	×	X	×				×			
X	X	X	×										
			X	X	X				×		X		
												×	

Steel Toe Caps
Non-Skid Shoes
Wooden Soles
Chrome Loather
Rubber
Conductive Rubber



Westinghouse Electric Corp.

# **Clothing That Protects**

# Something for every part of the body

WORK CLOTHES, regardless of the wearer's occupation, should be designed to meet these requirements:

- Adequate protection for the job exposure.
- Comfort and freedom of movement.
- 3. Durability.
- 4. Appearance.

Proper design and fitting are essential in all work clothing. Long, loose sleeves may get caught in machinery. Trouser cuffs may cause tripping.

Appearance has a particular ap-

peal to women, but men are not indifferent to it. Cleanliness also is an aid to morale as well as to health and safety. Garments soaked in oil or flammable solvent ignite easily. Any organic solvent, flammable or nonflammable, may cause skin irritation.

Standards. Specifications have been established by the Federal Government for civil and military personnel, and these are available for private industry. During World War II a series of war standards was approved by the American Stand-

ards Association, but these have not been revised to include subsequent developments in this field.

Products of the leading manufacturers meet high standards of workmanship, materials, and protection for specified hazards. Their representatives can be extremely helpful in selecting equipment and planning programs.

### Job Hazards

Safety (protective) clothing refers to garments designed for jobs where ordinary work clothes do not provide adequate protection.



# WIL-GARD SOFT-LINED GLOVES Stay Where They Belong...ON THE HANDS

Gloves can't protect hands if they're not worn. Wil-Gard Soft-Lined

Gloves are worn . . . because they're comfortable and easy to wear! Made of pure, natural

latex, or Wilson balanced-formula Neoprene, Wil-Gard Soft-Lined Gloves provide maximum finger

sensitivity, while a soft cotton fiber lining, locked in by an exclusive process,

checks hand perspiration. And WIL-GRIP Firmhold gripping edges on palms and fingers assure a safer, surer grip.

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Write today for FREE Wil-Gard Catalog NEW EXCLUSIVE WIL-GRIP FIRMHOLD FINISH
Better gripping action in wet or dry service

WIN-223-64

THE WILSON RUBBER COMPANY INDUSTRIAL DIVISION CANTON & OHIO

Circle Item No. 88-Reader Service Card

Exposures requiring the use of special garments include:

- Heat—Hot metal splashes, sparks, tapping furnaces, fighting fires, radiant heat.
- 2. Corrosive materials, solvents.
- 3. Low temperatures.
- 4. Flying objects.
- Cuts, abrasions, and bruises from sharp or rough edges.

# **Heavy-Duty Clothes**

Cotton and wool are the traditional materials for work clothes. In recent years a variety of synthetic fibers has been added to the available materials.

Cotton is available in a variety of weights and weaves. Most useful of these is duck. It can be flameproofed or made water resistant. It is used as a backing for rubber, neoprene, or plastic films. It is aluminized for garments used for protection against radiated heat.

Modern flameproofing methods have made cotton fabrics suitable for many occupations which formerly required heavier garments of chrome leather or asbestos.

Wool offers excellent protection against heat and cold. It is used for lining asbestos garments. It is resistant to sparks and molten metal splashes and will not support flame.

Synthetic fabrics are resistant to rot, mildew, insects, sunlight, moisture, and a wide range of chemicals. Most of these fibers will char when exposed to flame but are either slow-burning or will not support combustion. Synthetic materials vary widely in their characteristics, and the manufacturer should be consulted about specific exposures.

For work clothes the most widely used are the acrylic fibers, Dynel and Orlon. Among the largest users of these materials are chemical plants, where daily contact with acids and caustic solutions causes rapid deterioration of organic fibers.

A problem in many industries is to find materials that will stand the vigorous laundering needed to remove grime and chemical and the wear and tear while being worn. Here synthetic fabrics have proved their value.

Atomic energy installations make severe demands on work garments which must be washed frequently in strong decontamination chemicals. Acrylic fibers are reported to show exceptional endurance to this treatment.

Water repellency and spot and stain resistance can be increased by a silicone finish. This reduces the amount of cleaning needed.

Anti-static finish. In the past, synthetic fibers have been barred from locations where static electricity is a hazard. A recently developed process has made it possible to make Dynel highly conductive. This process is said to withstand repeated launderings. With some other fibers, treatment with an anti-static agent in each laundering will minimize the static hazard.

The finish repels dust and lint and is said to be easy to decontaminate after radioactive exposure.

Impervious materials of many types provide protection against dust, vapors, moisture, and corrosive liquids. They are useful in handling materials which would cause burns or dermatitis. This type of material includes rubber, neoprene, and vinyl films and fabrics coated with them.

Rubber resists acids, caustics, and other corrosive substances, as well as moisture. Garments of rubberized fabrics are used when handling low concentrations of acids and non-



UTILITY GARMENTS of vinyl sheeting offer protection against moisture and many chemicals. Material is light in weight and has high dielectric strength. (Union Carbide Plantics (Ca))

caustic liquids and for protection against weather. High dielectric strength makes it useful where electricity is used.

Neoprene, a synthetic rubber with many useful qualities, is widely used in safety equipment. It forms a tough durable film resistant to acids, solvents, and alkalis. It has high dielectric strength.

Vinyl plastic is resistant to moisture and a wide range of chemicals. It can be rolled or calendered onto fabric, or it can be used as a strong, pliable film without backing.

Water-repellent duck combines strength and durability with light weight. It is used in exposure to moisture and non-corrosive liquids.

# For Hot Jobs

Fire resisting garments include aprons, coats, coveralls, pants, hoods, leggings, spats, sleeves, gloves, mittens, and hand pads.

Materials commonly used are flameproofed duck, chrome leather, asbestos, and aluminized fabrics asbestos, glass fiber, and duck.

Flameproofed fabrics, No fabric suitable for clothing can be made "fireproof," but these treated materials will not support combustion. They have proved practical for many operations, such as welding and foundry work.

Flameproofed garments are obtainable in most items used in industry. Some types of treatment will stand repeated launderings. Other compounds used in industrial and commercial laundries can be applied after laundering.

Flameproofed garments should be plainly marked, so untreated clothing will not be used by mistake.

Modern flameproofing methods have made cotton fabrics suitable for many occupations which formerly required heavier garments of chrome leather or asbestos. However, flameproofed cotton should not be used for the more severe exposures.

Chrome leather is designed for rough use, such as sandblasting and for protection from hot sparks and molten metal in arc welding. Metal



THERE'S A TYPE of glove, mitten, or handpad for practically every job. Cotton, leather, asbestos, rubber, and neoprene are represented in this group.

# **Below** the Shoulder

# Hands, arms and the man

FINGERS, hands, and arms are involved in approximately one-third of all reported occupational injuries, in addition to a large number of unreported first aid cases. Although the worker returns to the job, there is time spent in treatment and perhaps reduced efficiency for a few hours.

The hands, so essential in performing every type of work, are exposed to cuts, scratches, burns, and bruises in the course of a day's work.

Finger movement is necessary for practically all jobs, which makes protection more difficult than for most other parts of the body. For the forearm, semi-rigid protectors are often practicable.

Types of protection available in a wide variety of styles and materials include:

- 1. Gloves
- 2. Mittens
- 3. Hand pads
- 4. Arm protectors
- 5. Sleeves
- 6. Finger guards
- 7. Protective creams

Generally, gloves, mittens, or hand pads should not be worn around revolving machinery. An exception is buffing and polishing on high-speed lathes where parts become too hot to handle with bare hands.

Ordinary cotton work gloves offer

some protection on light jobs but many industrial operations require hand protection of more durable material in a variety of specialized designs.

Common materials are:

Canvas—relatively low in price and suitable for light work. It is washable.

**Duck** and **terry cloth**—are used for handling objects which are not too rough, sharp, or hot.

"Hot mill" gloves are made from a heavy twisted weave fabric which also gives good service for handling rough objects.

Leather—is more durable for most industrial uses. It offers greater protection against cuts and abrasions.

Chrome leather is used where there is exposure to sparks or molten metal. However, no material of animal or vegetable origin will stand continued excessive heat.

Asbestos—used where hands must be protected against extreme heat, as in steel mills, heat treating plants, welding, galvanizing, and glass manufacturing.

Asbestos gloves may be obtained unlined or with lining of flame-proof fabric or wool. Lining is desirable for comfort and added protection against heat. It also keeps the hand from rubbing against rough inside seams, which unravel from movement of the hand.

Heat-repelling mittens of aluminum-coated fabric between two layers of asbestos, jersey lined, offer unusual protection against heat. These mittens are reversible.

**Rubber, neoprene,** and vinyl films—suitable for chemical laboratories and plants where acids and other corrosives are handled.

Neoprene and vinyl are particularly useful where petroleum products and organic solvents are handled. Plastics vary in their resistance to chemicals and the manufacturer should be consulted about exposures.

Fabrics coated with rubber, neoprene or vinyl are used for light cleaning operations. They offer greater protection against abrasion than uncoated fabric.

-To page 152

MR. NEOLITE PROUDLY ANNOUNCES ..

# A giant step in safety underfoot!



# new COBRA oil proof soles

# Non-skid, self-cleaning design for sure-footed safety on slick surfaces

Not only oil resistant but oil *proof!* That's the great advance in safety work shoes now brought to you by the Goodyear Research Laboratories. This Cobra Oil Proof Sole combines the sure-grip design of the regular Goodyear Cobra Sole with a new oil proof compound material. And it's this combination that makes the Cobra Oil Proof Sole today's top safety sole for wear in every shop, factory or working place where slippery floors are a hazard. Add a new dimension to your safety standards by specifying Cobra Oil Proof Soles whenever you choose work shoes.



COBRA OIL SOLES made GOOD FYEAR

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# HY-TEST

# Fully-Waterproof

HY-TEST Scores Again! Here are the latest ... fully-waterproof, tested and proved boot, shoe and oxford styles ... made by HY-TEST under the high Standards of Quality of International Shoe Company. These styles incorporate the exclusive Anchor Flange® Steel Box Toe and other HY-TEST safety features. Uppers are SYLFLEX® leather; shoes are completely leather lined with Hy-quality insoles. Seams and needle holes are sealed with self-vulcanizing adhesive. Resist-Oil Grit anti-slip soles and heels are shaped and molded right to the uppers by hydraulic pressure and heat to create a firm bond and assure an absolute seal.







Long-wearing Resist-Oil soles and heels are water-tight... Shaped and vulcanized right to the upper.



Completely sealed at seams and stirching ... Sylflex "free-breathing" yet water-repellent leather uppers.



Extra safety feature ... inside rounded to minimize tripping and heels are easily repairable

SINCE WELT CONSTRUCTION ...

# Introduces Safety Shoes

Featuring...

Sylflex<sup>®</sup> Leather Sealed Upper Seams and Water-Tight



# MOLDED CONSTRUCTION

Flexible • Light-on-the-Foot • Long-Wearing • Comfortable

Do you have a wet work problem which requires a fully waterproof safety shoe? To be sure your workers are protected, specify HY-TEST's H681 (boot), H641 (shoe) or H601 (oxford). Write today for complete details.

HY-TEST SAFEty SHOES

Division INTERNATIONAL SHOE COMPANY

1509 Washington Ave., St. Louis 66, Mo. Teletype: SL300

927 N. 3rd St., Philadelphia 23, Pa. Teletype: PH476 h601...Mon's brown sides (Sylflex) exford brown Resist-Oll Grit sole and heel.

D & E...6-12



# HIY-II-SI

SAFETY SHOES FOR EVERY NEED



INSTEP PROTECTORS, available in some models, extend the protection from safety shoes. (Chambers Works News, E. I. du Pont de Nemours & Co.)

SAFETY SHOES for industrial use may be classified in five general categories according to construction and intended use:

- 1. Steel box toe (general use).
- 2. Conductive.
- Explosives operations (non-sparking).
- 4. Electrical hazard (shock-resisting).
  - 5. Foundry.

Special styles for men and women are provided in classes 1, 2, and 3.

As generally used, the term "safety shoe" means a shoe with a reinforced toe. Steel toe boxes are specified for most occupations because of their ability to resist heavy blows.

Safety shoes are now available in a great variety of types for occupational needs. Soles and heels may be obtained in leather and in combinations of rubber and neoprene with cord and cork. Leather for both soles and uppers can be obtained in grades resistant to moisture and some chemicals.

## Standards

American War Standard, Z41 Series, American Standards Association, are still useful guides for purchasers of safety shoes.

Specifications call for a well-constructed, durable work shoe with a toe reinforced by a steel box. The box is supported on a flange resting on the sole. It must support a static load of 2,500 lbs. and resist the impact of a 50-lb. weight dropped 1 foot.

# Feet in Armor

# Steel toe caps and footguards ward off heavy blows

When subjected to either test, the inside of the toe box must not come closer than ½ inch from the upper surface of the sole.

Strength requirements for shoes for both men and women are identical.

# Distribution

To secure acceptance of foot protection, safety shoes must be comfortable and properly fitted. Purchasing must also be made convenient.

Many large companies maintain well equipped stores with a wide range of lasts and sizes and trained attendants to fit the shoes. Shoes are sold at cost on the payroll deduction plan. Safety shoes are sometimes awarded as contest prizes.

Smaller plants are not always in a position to stock an adequate range of sizes or provide expert fitting service. Many companies make arrangements with local dealers whereby employees may purchase shoes through payroll deduction.

A mobile shoe service is offered by dealers in some areas. A truck equipped as a shoe store is manned by an experienced fitter who is responsible for all adjustments. A variety of styles and full range of sizes are carried. Periodic visits are arranged and between visits shoes can be obtained quickly on special order.

This service is rendered on a moderate mark-up basis and the plant can charge the employee any part of the cost.

A worker should have more than one pair of safety shoes so they can be rotated. Shoes will last longer and be easier on the feet. The wearer will also have a pair available while the other is being repaired.

Many companies encouraged the purchase of safety shoes for wear off the job. These shoes have prevented many toe injuries at home and offer needed protection when operating power mowers.

Records for each employee should be kept. A 3 x 5 in. card shows name, department, payroll number, and details of each transaction. These include date, stock number, size, width, price, and payment. The reverse side of the card carries such information as history, details of any foot trouble, and other comments.

-To page 142



SAFETY SHOES can be rugged or dressy. For severe foot hazards, there are metal foot guards covering toes and instep.



# HERE'S THE PITCH!

We know we can't sell steel toes to any industrial safety man... any place, any time. Yet, year after year we continue to spend good money for full page advertising in the leading safety journals.

Why?... Because we want industry to know that the most important part of a safety shoe is the hidden ... steel toe.

The high standards we have set for ourselves are industry's guarantee that Safety Box Toe Company is continuing to produce for all safety shoe manufacturers... AUSTEMPERED steel toes of the finest quality and design that modern science can create.

Write today for your illustrated copy of A PROGRESS REPORT OF INDUSTRIAL FOOT PROTECTION



# Safety Box Toe Company

812 STATLER BUILDING . BOSTON



For Industrial and Commercial Use

Everyone near the water needs a Res-Q-Pak . . . the pocket-size emergency life preserver. It's about the size of a pack of cigarettes and weighs less than six ounces. Deflated or inflated, it is fastened securely by means of a bulldog metal clip . . . can't get away in the water. Designed for adult . a strong squeeze will pop up the large two foot water-wing float. It is distress orange in color for easy visibility. Will support a fully clothed,

250 lb. man for hours.

Every Res-Q-Pak is laboratory tested and guaranteed. Shipped 9 to a carton. Shipping weight, 4 lbs. List \$5.00 each. Standard Res-Q-Pak also available at \$2.98 list. Contact your distributor or write direct.

# THE MUTER COMPANY

1259 South Michigan Avenue Chicago 5, Illinois



# FOOT-TOE-LEG Protection by "Sankey" (left) Improved FOOT GUARD

with full RUBBER SOLE FOOTGUARDS consist essentially

of a metal shield to be worn over the shoe whenever the foot is in danger of being either crushed or cut. The metal shield is designed to furnish a maximum

amount of protection to the entire footnot merely to the toes alone, but also to the instep-against hazards from falling, rolling or flying objects, or from accidental tool blows.



fills a demand for toe protection in occupations where hazards injurious to toes exist. They fit any shoe, afford maximum toe protection, and like the foot guards do not encase the toe to the discomfort of the worker.

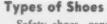


# COMBINATION FOOT AND SHIN GUARD (right) consists of the Foot Guard and a Shin Guard of the same light but strong metal fastened to the foot guard. The fastening permits free action of the leg in any direction.

For more information write today

**ELLWOOD SAFETY APPLIANCE CO.** 225 SIXTH ST .- NSC ELLWOOD CITY, PA.

Circle Item No. 92—Reader Service Card



Safety shoes, generally, are well made on lasts designed for comfort. They are available in many types and styles, some suitable for street wear. The protective toe box does not add appreciably to the weight or cost of the shoe.

General purpose shoe. The most widely used type is the blucher, high cut oxford. It is available in a wide range of sizes, widths and lasts, ranging from rugged, heavy-duty styles to those suitable for street wear. It is the basic type, with certain differences in detail for special occupations.

Foundry shoes. An early type of safety shoe still in use is the foundry shoe with elastic panels at the sides. There is no opening on the instep where molten metal or hot sand can penetrate and the shoe can be pulled off quickly in an emergency. This model is furnished with steel box

Spark-proof shoes. Shoes with brass hooks and evelets and brass nailed heels are worn in some industries where sparks from iron or steel might ignite flammable gases.

Shock-resisting shoes, designed for work around electric equipment, have no metal parts except insulated steel box toes. They are also worn by those handling flammable materials, by workers in explosives plants, and in grain products refining operations.

Where it is felt that impact resistance must be compromised with the need for insulation, toe boxes of fiber or plastic are sometimes used. Such shoes, however, are not classed as "safety" shoes.

Conductive shoes are designed to drain off static charges to prevent their building up in the body to the point where they could cause a spark.

The conductivity of these shoes is affected by other conditions. Wool, natural silk, and nylon socks act as insulators to the body; cotton, lisle, or rayon are satisfactory. Foot powder also serves as an insulator.

The floor as well as the shoes must be conductive.



Insulated shoes. Where feet are exposed to extremes of heat or cold, shoes with heavy insulation give needed protection.

Instep protectors. Some models have tough, shock-absorbing guards over the instep. These provide added protection without hampering movement of the feet.

Toe clips. Where men will not or cannot wear safety shoes, steel clips nailed to the shoes or attached with spring clips can be provided. These are sometimes used by temporary crews but are not substitutes for safety shoes.

Rubber footwear. Where work must be done in deep mud or in water, rubber boots contribute to health, comfort, and safety. Rubber boots are available with steel box toes.

#### Soles and Heels

Slip-resistant soles and heels are good for general use since slipping hazards are frequently found where they are not expected. No type of footwear, however, is a substitute for good housekeeping. Even non-slip soles and heels cannot provide a sure footing where there are heavy accumulations of oil, grease, and other slippery materials.

Leather is comfortable and durable for normal conditions. Leather does not give satisfactory service where heat is excessive or where the shoe is subjected to constant dampness.

Rubber is resistant to moisture, alkalis, and most acids. It deteriorates quickly when exposed to grease, oil, solvents, some acids, or excessive heat.

Neoprene resists moisture, also grease, oil, and solvents that would ruin rubber. It stands up well against cutting and abrasion.

Cord soles and heels of rubber or neoprene, similar in construction to automobile tires, give good traction under severe conditions for many operations.

Cork blended with rubber or neoprene provides good slip resist
—To page 147



# Aluminized Heat Barrier | Garments reduce kiln downtime for Pittsburgh Coke and Chemical Company Cement Plant

A new safety garment reduces kiln cooling downtime before repair work at Pittsburgh Coke and Chemical Company's cement plant. H. J. Haeffner, Plant Superintendent, reports important time and dollar savings through use of the new garments.

They're made of lightweight, flexible 3M Aluminized Fabric that reflects up to 90% of radiant heat. Against "hot spots" of 1800° F, 3M Aluminized Fabric gives workers comfort never before possible. This means faster, more efficient work and less downtime. Lasting up to 50% longer, 3M Aluminized Fabric safety garments are available from leading manufacturers.

Send coupon for details and free sample.

# Free Swatches

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Please send me 3M Alum	inized Fabric swatches and information.		
NameTitle			
Firm			
Address			
City	ZoneState		
Minnesota	Mining and Manufacturing Company		

# There's a wealth of foot-



LEHIGH SAFETY SHOE COMPANY . EMMAUS, PA.

# safety news at... BOOTH No.16

# **GREATER NEW YORK SAFETY EXPOSITION**

Hotel Statler, New York

**APRIL 13-17** 

NEW MERCHANDISING DISPLAY STAND shipped FREE with your initial order for Lehigh Safety Shoes



...and if you're not coming to New York for the Show

# mail this coupon now

for your copy of new Lehigh Catalog No. 18A listing these new items and 71 other styles

EHIG	H Saf	ety	Shoe	Co.,	Emm	aus	, Pa.				
Please	send	at	once,	free	сору	of	your	new	Catalog	No.	18A.

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# DYNEL

# MEANS PROVED USE ECONOMY

in chemically resistant industrial clothing

# VIRTUALLY UNAFFECTED BY ACIDS AND ALKALIES

Dynel resists chemical deterioration, laundering and abrasion...delivers important use economy.

# GET THE FACTS ON CHEMICAL RESISTANCE

Write for booklet detailing effects of reagents on Dynel fabric after 20-hr. immersion tests.





Long usage proves DYNEL is virtually unaffected by acids, alkalies and strong detergents . . . stands up to rugged abuse of long hard wear and commercial laundering. Right now, DYNEL clothing is more than paying for itself in acid plants, electroplating, battery manufacturing—where corrosive atmospheres tend to deteriorate clothing. To discover the savings DYNEL affords you, write Department NSN.

DYNEL · a CARRIE

UNION

textile fiber

Textile Fibers Department, Union Carbide Chemicals Company, Division of Union Carbide Corporation, 100 East 42nd Street, New York 17, N. Y. Offices in Boston, Mass. at 300 First Avenue, Needham Heights; Charlotte, N. C. at 1213 Liberty Life Building; Montreal, Que.; Toronto, Ont.

"Union Carbide" is a registered trade-mark of UCC

Circle Item No. 96-Reader Service Card

National Safety News, March, 1959

## Feet in Armor

-From page 140

ance and the soles are light and flexible. Cork also helps to insulate feet against heat or cold.

Wood soles are used for extreme conditions of heat, dampness, oil, acids, or caustics underfoot. They are worn in steel mills, foundries, for handling asphalt and other hot operations. They also afford protection against nails, broken glass, scrap metal, and other sharp objects.

Wooden-soled shoes can be obtained with steel toe boxes or with guards which cover toes and insteps.

#### **Foot Guards**

Where unusually heavy objects are handled, feet may need more protection than shoes with reinforced toes. For such work, there are foot guards of heavy-gauge, flanged, and corrugated metal.

The guards are strapped on over the shoes and protect the instep as well as the toes.

With the flange resting on a firm floor surface, foot guards should stand an impact of at least 300 footpounds without being dented sufficiently to damage the shoe underneath or injure the foot.

Foot guards are also made with soles of rubber or calked steel to minimize slipping hazards.

Combination shin-foot guards, with an aluminum alloy shin protector hinged to the foot guard, are available. \* \* \*

References—Protection for Feet, Hands, Arms, Legs, Body

### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

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Good Customers for the Shoe Business; Oct. 1952.

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The Glove with a Hundred Uses; Draper Allen; Sept. 1957.

Haberdashery for Hot Jobs; July 1958. Tailored for Safety; Oct. 1958. How the Navy Protects Its Feet; Alan

Turnbull, July 1958.

Looking Over the Plastics; Donald H. Yarnall, Oct. 1958.

"Federal Specs"

-From page 5

tative texts on many aspects of industrial health and safety.

The National Bureau of Standards is looked to by safety men everywhere as the authority on many technical phases of accident prevention. Its studies and reports on elimination of fire hazards, radiation protection, building construction, electrical hazards, protective cloth-

ing and equipment, radio installation and elevator safety are worldrecognized standards and guides. It keeps a close watch on the quality of many of the government's purchases.

The Bureau does much of its safety work in cooperation with the American Standards Association. It does the technical work necessary to establish construction codes and standards and is the sponsor of the ASA Code for the Protection of Head, Eyes and Respiratory Organs.



Famous WORKLON acid-resistant

# Safety Belts and Harnesses

## For routine and emergency use

SAFETY BELTS or harnesses with life lines are required:

- 1. For work at high levels.
- 2. In closed spaces where air may be irrespirable.
- Where there is danger of being buried by slides of loose material.

Occupations in which safety belts are used routinely or occasionally include:

- -Structural steel and bridge workers
- -Window cleaners
- -Public utility linemen
- -Forestry workers
- -Cranemen
- -Miners
- -Mechanics
- -Painters
- —Workers entering tanks, bins, and underground passages.

In selecting equipment, consider two types of use—normal and emergency.

Normal use involves comparatively light stresses applied during regular work. These stresses rarely exceed the static weight of the wearer.

Emergency use means stopping a man when he falls. This may subject every part of the belt to an impact loading many times the weight of the wearer.

# Types of Equipment

Types of belt and harness have been developed for various occupations. Most familiar are the lineman's belt and safety strap and the window cleaner's belt.

These belts are built for extra severe use. Both belting material and hardware are the result of much research and experience in the field. Belts are usually serially numbered and dated so records of age and condition may be kept.

Materials. Leather and cotton or linen webbing belts are provided by most manufacturers.

Well-tanned and oiled leather resists most chemicals but it should not be left in contact with them. Regular cleaning after use is important.

Leather ¼-in. thick and 1½-in. wide will have an ultimate strength of about 500 lbs. This is adequate for lifting a man out of a tank or bin.

Webbing will stand more heat than leather, and after soaking in water, will dry out in its natural condition. Friction buckles can be used with webbing, avoiding loss of strength at buckle holes.

Belts intended to check a fall demand strength proportionate to possible distance of fall and weight of body. A 2-in. by ¼-in. leather belt would probably arrest the fall of a window washer at 6 ft. It might break at 10 ft.

For a comfortable margin of safety, a window cleaner's leather belt should be at least 3-in. by \(^1/4\)-in.

Webbing of special type is available for certain uses. It can be treated to resist paint and mildew. For the chemical and petroleum industries, webbing impregnated with neoprene resists acid conditions.

Quick release from a safety belt may be desirable in case of fire. Petroleum workers, for instance, use belts with a quick release buckle which can be disengaged instantly by a single motion of the hand.

Belts for some occupations contain loops and pockets for light tools.

For many occupations a lighter belt will provide ample protection. These may be of the simple body



SAFETY BELTS and window anchors are indispensable for window washing. (Port of New York Authority.)

type or the harness type. Both types have a **D** to which a life line is attached. The harness type distributes the shock over the shoulders, back, and waist instead of concentrating it at the waist.

Body harness with life line attached expedites rescue if the wearer should be overcome by gas or vapors, buried by falls of loose materials or injured in confined spaces.

Wherever work requires a supplier-air respirator, harness and life line rather than a belt should be used.

If long free falls are possible, harness should be designed to distribute the impact force over legs and chest as well as waist.

The longer the free fall, the greater the impact force exerted upon harness and life line. Tie off the line as short as movements of the worker will permit.

Boatswain's chair. Where a belt must support the entire weight of a man while he works, as in raising and lowering him along the wall of a building, a boatswain's swing chair should be used. In this type of belt, one strap is used as a seat, sometimes with a board to make it more comfortable. Attached to the seat strap at each side is a strap around the waist to prevent his falting out of the seat. The waist strap permits the wearer to stand or sit.

Tool buckets of collapsible canvas are needed on some jobs so the worker may have his hands free while climbing. Edge tools should be protected by guards while being carried.

Shock absorbers incorporated in harness and life lines reduce the severity of impact. This decreases both the possibility of injury to the wearer and failure of the equipment.

Life lines. For most life lines, ¾-in. manila rope or ½-in. nylon rope is recommended.

Nylon rope has more stretch than manila which enables it to absorb shock and sudden loads. It has high tensile strength wet or dry, is tough, flexible, durable, and easy to han-

-To page 158

# GOODALL

**SINCE 1870** 

The Goodall products described below are made to the highest standards for quality in materials and workmanship, with their safety features thoroughly proven in service to many industries. You can purchase them with complete confidence that they will fulfill their intended purpose to your entire satisfaction.

Safety
PRODUCTS

# "TOE-SAVER" SAFETY BOOTS

Surest protection against toe injuries, with all the wearing comfort of a first-quality boot. Built-in, reinforced steel toe cap tested to withstand 2,000 lbs. pressure per square inch. Covered by a white toe cap for quick identification by Safety Engineers. This boot is made of smooth, tough, flexible black rubber, lined with

heavy duck. A cushion insole adds to its comfort, and a tire-tread outsole guards against slipping on wet or greasy floors. Available in all boot sizes, in full hip, three-quarter and short.



# "RUBBERHIDE" SAFETY INNERSOLES



Eliminate foot injuries resulting from punctures by nails and other sharppointed underfoot objects. Made with sheet of thin, high-tensile spring steel, inseparably bonded between layer of top-grade sole leather, and layer of rubberized canvas duck. Extremely flexible, light in weight, "easy to wear". In all rubber boot and bootlast shoe sizes.



# "GOODSEAL" SAFETY GLOVES

Made of a special rubber compound that withstands constant contact with virtually all solids and solutions. Smooth, flexible, and highly resistant to snagging and puncturing.

"Goodseal" Gloves are available in light,



"HARDBOILED"

FIBREGLASS OR ALUMINUM

The ultimate in head pro-

tection, yet light-weight

and comfortable. Exceed

highest established require-

ments for strength; heat,

fire and moisture resist-

ance; and dielectric tests.

Wide range of colors.

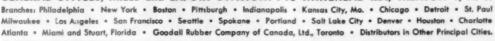
medium and heavy weights, some styles having turned-up cuffs to keep chemicals and acids from arms and clothing.

# PROTECTIVE SUITS, COATS, APRONS

A style for every kind of work in field, plant or laboratory, in rubber, neoprene latex and oiled. Designed for maximum protection and comfort, and made to assure unequalled value through durability and long wear. Write for copy of special Clothing Catalog.

# GOODALL RUBBER COMPANY

GENERAL OFFICES, MILLS and EXPORT DIVISION: 710 WHITEHEAD RD., TRENTON 4, N. J.







# Safety shoes for

No matter what kind of feats your men perform—Thom McAn has a safety shoe to fill the job. 40 different styles. Each designed to give your men maximum protection on their particular job. All designed to be easy on the feet all through the day. Below is a description of the shoes above—and the feats they fill.

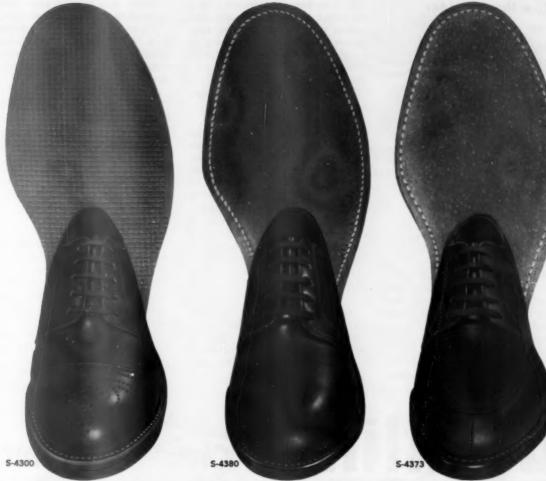
5-4131—Looking for a boot that grips on oil and greasy surfaces? How about this 6-inch tan glove-leather blucher? Its got the great Neo-cord sole and heel that cuts right through oil and grease giving greater gripping power. Laces to toe. Leather lined steel toe. Rivet reinforced. C 7-12, D 6-13, E-EE 6-12.

5-4186—Your men on their feet a lot at work? Here's a 6-inch blucher just made for walking. This boot's oil- and water-resistant Ripple® Sole gives them tops in walking comfort, as it absorbs walking shock and lessens fatigue. Leather lined steel toe. C 8-12, D 6-12, EE 6-12.

5-4115—Work with chemicals and dyes? Try this 6-inch Quilon® tanned (water and chemical resistant) brown work blucher. Its Neoprene sole and heel resists chemicals, acids, dyes. Acid-resistant laces, too. Leather lined steel toe. B 8-12, C 7-12, D 6-14, E-EE-EEE 6-12.

S-4300—Your men need a light weight shoe? This brown U-wing work-or-dress oxford could be just the ticket. Its Nitro-crepe sole feels light and springy to the feet. Leather lined steel toe. A 8-12, B 8-14, C 6-13, D-E-EE-EEE 6-12.

# Thom



# all kinds of feats!

5-4380—Prefer a leather sole shoe? Look no further. This handsome brown work-or-dress oxford has our long wearing chrome-tanned sole made only from top quality leather. Neoprene heel. Leather lined steel toe. B 7-12, C 6-13, D 5-12, E-EE 6-12.

s-4373—Got a hot job? Cool the feet with this brown leather moccasin style oxford featuring our heat-resistant Neo-cork sole. This sole also resists oil and liquids. Cushion inner sole. Leather lined steel toe. B 8-12, C 7-12, D 6-13, E 6-14, EE 6-12.

# McAn

A Division of Melville Shoe Corporation

Thom McAn Safety Shoe Division, 25 W. 43 St., N.Y. 36

Gentlemen: Please send me the following at once: (Check service required)

- ☐ Details of Thom McAn's Special In-Plant Fitting Plan
- ☐ Fully illustrated list of Thom McAn Safety Shoes
- ☐ Set of safety posters
- Address of nearest Thom McAn Safety Shoe Store

Name\_\_\_\_\_Position\_\_\_\_

Firm

Address

City\_\_\_\_\_State\_\_\_\_

Circle Item No. 99-Reader Service Card

Section 6-Personal Protection-Part 2

## **Below the Shoulder**

-From page 136

When rubber or plastic gloves are worn for long periods, a lightweight fabric liner is desirable. If no liner is available, talcum powder should be shaken into the gloves before wearing.

Rubber, plastic, and asbestos gloves should extend well above the wrists. Gauntlets should have locking devices to assure a snug fit about the wrists. Sleeves should be kept rolled down, leaving no skin exposed.

Metal mesh gloves—used in meat and other cutting. They should fit snugly.

Metal staples in gloves, mittens, and hand leathers give increased protection when handling sharp or rough objects. Metal-studded gloves should not be worn around electric apparatus.

Lead-rubber gloves—protect the hands against x-rays and the gamma

rays of radioactive materials. They are worn by medical, industrial, and nuclear technicians. The glove may include a leather outer covering to prevent damage to the lead-impregnated rubber.

**Lead-leather gloves**—also worn for radiation exposures.

Linemen's gloves are rubber gloves worn by linemen and others engaged in electrical work. They are of a special type made to exacting specifications. They should be tested regularly and discarded when found worn, cracked, or punctured.

For line work, overgloves of leather protect the rubber against damage.

Gauntlets offer some protection to the wrist.

Arm protectors guard the forearm against cuts and light blows. The materials, depending on the protection required, include duck, wool, leather, rubber, plastics, and asbestos. Finger stalls may be used where a complete glove is not necessary.

These are available in combinations of one or more fingers. Materials used are rubber, leather, plastic, duck, asbestos, and metal mesh.

Hand pads are often more satisfactory than gloves for protection from heat, abrasion, or splinters. They can be heavier and less flexible than gloves.

Hand pads are obtainable in leather, asbestos, and twisted weave fabric.

#### **Protective Creams**

Creams are helpful in protecting the skin against many irritants when safety clothing is not practicable. These products are made in watersoluble and water-resistant types, each in several grades for differing exposures.

Water-soluble creams are used for protection against cutting oils, paints, lacquers and varnishes.

Water-resisting applications are

# Bashlin's Linemen's SAFETY EQUIPMENT



Section 6-Personal Protection-Part 2



A trusted name on shoe bottoms since 1924

Ideal for those who stand on factory and warehouse floors or work on the hazardous oil, grease and tar surfaces of gas stations or road construction.

BEARFOOT SOLE COMPANY, INC. . WADSWORTH, OHIO

Boston: 210 Lincoln Street, H. T. Fogg, Manager 

Milwaukee: 1931 S. Allis, Atkinson Sales Co.

St. Lauis: 1602 Locust Street, D. W. Murray, Manager Glenside, Pa.: 124 S. Easton Road, R. L. Stiles & Co.

New York: 225 West 34th Street, Homer Bear

#### Section 6-Personal Protection-Part 2

used where the cutting oil, cooling lubricant, or other irritant has a water content of more than 10 per cent. These can be removed with soap and warm water.

To be effective, coatings should be renewed frequently. They are not intended for protection against highly corrosive substances. \* \* \*

# Leg Protection

PROTECTION for the legs is required where workers are exposed to the hazards of hot materials, corrosive substances, blows from sharp tools or heavy objects, and bites of poisonous snakes.

Garments commonly worn are:

- 1. Spats
- 2. Leggings
- 3. Shin guards
- 4. Knee pads

Leggings. For men who are exposed to direct or conducted heat, as in foundries and steel mills, leggings are available in asbestos chrome leather and flameproofed duck in spats, knee-length, and hiplength. For radiant heat aluminized asbestos and duck are worn.

Where molten metal is handled, leggings should have flares to protect the instep. They should be free from projecting buckles and clasps and be instantly removable in an emergency.



FOR HEAVY WORK, combination shin and foot guards give added protection.

For protection against corrosive and relatively harmless liquids, leggings are available in knee and hip lengths and a variety of impervious materials.

Impregnated duck offers protection against moisture and detergent solutions.

For more severe exposures fabric coated with plastic, natural rubber, or neoprene gives greater protection.

Plastic resists oils, solvents, mild alkalis, and acids.

Rubber offers protection against concentrated acids, alkalis, and salts.

Neoprene resists oils and organic solvents.

For more severe exposures fabric dampness and corrosive liquids, there are boots of natural rubber, synthetic rubber, and plastic. These are available in knee and hip lengths, also waders similar to those used by duck hunters and fishermen.

Where poisonous snakes are a hazard, heavy leggings or high boots

are worn by construction, public utility, and farm workers.

Shin guards of metal or fiber provide important protection where axes or adzes are used. Shin guards are available separately or combined with metal foot guards which cover the instep.

Knee pads are worn by electricians, pipefitters, riggers, cement workers, laborers, and others who must kneel more or less continually at work, particularly in confined spaces.

Two types are available. One consists of a pad or cushion made of chrome leather or asbestos cloth. This type is used for kneeling on hot surfaces. The other type is made of solid or sponge rubber molded to fit the contour of the knee. Straps keep the pads in place while the wearer is either kneeling or standing.

# Increase the Wear From Safety Shoes

Keeping shoes clean adds to their life as well as to their appearance. Muddy shoes should be cleaned with mild soapsuds or saddle soap and wiped dry.

Shoes can be preserved and made more water repellent by treating with animal or vegetable oils or shoe compounds or silicone dressing once a week or oftener. Polishing with shoe polish helps to preserve leather.

When shoes become wet from perspiration or from outside moisture, they should be dried away from heat. When drying, shoes should be placed on ventilated shoe trees to keep their shapes. If shoe trees are not available, shoes can be stuffed with crumpled newspaper. Dried shoes should be treated with neatsfoot oil.

#### FOOTWEAR FOR VARIOUS EXPOSURES

#### Types of Footwear

- 1. Conductive
- 2. Nonsparking
- 3. Foundry shoes
- 4. Wooden sole
- 5. Insulated
- 6. Felt pac
- 7. Linemen's boots
- 8. Rubber boots, overshoes
- 9. Neoprene boots, overshoes
- 10. Asbestos overshoes
- 11. Shower sandals
- 12. Steel innersoles
- 13. Slip-resistant soles and heels (Cord and cork)
- 14. Footguards

#### Exposure

Moisture: 8, 9

Standing in water: 8, 9

Chemicals: 4, 8, 9

Oil and grease: 4, 9

Electric current: 5, 8, 9

Cinders: 4, 10

Hot surfaces: 4 Molten metal: 3

Molten metal. 3

Sharp and abrasive surfaces: 4, 12

Cold, snow, ice: 6

Explosion hazards: 1

Slippery surfaces: 13

Skin infections, athlete's foot:4, 11

Handling extra heavy objects: 14

Section 6—Personal Protection—Part 2



SAFETY SHOES WITH Soles and Heels

# VULCAINIZED

# DIRECTLY TO THE LEATHER UPPERS!

This new type Safety Shoe is the greatest advance in Modern Safety Footwear Construction.

An extra thick, hi-traction one piece molded Neoprene Sole and Heel Unit is Vulcanized directly to the leather upper, eliminating sole and inseam stitching (No stitches to fail or rot).

This adds flexibility and comfort—makes the shoe leak-proof.

The sole and heel unit is a special and very durable Neoprene compound, required by the high temperature and pressure used in the vulcanizing process. This results in the strongest and longest wearing Neoprene sole and heel known!

Other important features of the "Vulcan-izer":

- Vulcanizing Process eliminates 'lumpy' insoles
- Quilon treated upper leather
- Nailless Heel and Sole Construction
- Sole and Heel Unit is Repairable
- Full seamless leather vamp lining

HIGHLY RECOMMENDED FOR INDUSTRIAL WORKERS IN CHEMICAL AND OIL REFINERIES, STEEL PLANTS, SHIP YARDS, CONSTRUCTION AND GENERAL OUTDOOR WORK, WELDING.

Think Modern!

PLACE A TRIAL ORDER TODAY FOR IMMEDIATE DELIVERY

Available On Request

1959 SAFETY SHOE CATALOG

RECORD INDUSTRIAL COMPANY
DEPT. V, 3301 ARCH STREET, PHILADELPHIA 4, PA.

Circle Item No. 102—Reader Service Card

# Service that Satisfies



From the time your order for Iron Age safety shoes reaches our headquarters in Pittsburgh until it is rolling towards you, everything possible is done to expedite shipment.

We have installed a streamlined system for acknowledging, entering and following through on all orders, large or small. The latest in mechanized handling and cartoning speeds our superior quality safety shoes to you, when and as you need them.

All of us—our salesmen in the field and we at the plant—pledge a continuance of our policy that service to our customers comes first. That's another good reason why Iron Age has continued to gain increasing acceptance among safety supervisors everywhere.



No. 608—one of the more than 40 styles of Iron Age safety shoes.

# Iron Age Steel Toe SAFETY SHOES

1205 MADISON AVE. PITTSBURGH 12, PA.

Circle Item No. 103-Reader Service Card

# Here's why Iron Age Leads in Value

All Iron Age safety shoes are high styled. Their smart lines attract workers; make them want to wear *these* safety shoes . . . boost coverage.

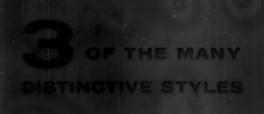
The Iron Age label is your assurance of top quality and long wear. Only the best grades of hides and the finest tannages are used—plus nationally advertised outsoles.

Iron Age sales and service representatives are located in all key industrial areas of the country. Why don't you call yours now for an eye-opening showing? He's as near as your phone, or write us and he will see you.



# Iron Age SAFETY SHOES

1205 MADISON AVE. PITTSBURGH 12, PA.





# Safety Belts

-From page 148

dle—resists moisture and mildew and can be stored wet.

Steel cable without a shock absorber should not be used for life lines where a free fall is possible, because its rigidity increases the impact load. Metal cables should not be used around electricity.

#### Care of Belts

Leather. Brush dust off carefully to avoid scratching. Then wash with warm water and saddle soap or mild soap. Rinse in clean, warm water and dry at room temperature.

Treat with neatsfoot, castor, soybean, or a compound oil, not a mineral oil.

Never expose to excessive heat. Watch carefully for cuts or scratches on the skin side of the hide. Condemn if there is a deep cut on the skin side.

Webbing. Fabric belts should not be worn if outer plies are cut or worn through. Wash in soapy water, rinse and dry in moderate heat. They will stand any heat up to the boiling point of water.

Consult manufacturer about dressing.

Hardware. Check and replace if it shows signs of wear. If riveted, examine each rivet separately.

**Inspection.** Employees who wear belts should inspect them before use. An experienced inspector should check them every 1 to 3 months.

Life lines. Wash with mild soap and water and dry in circulating air. Do not expose to high temperatures. Keep rope in open coils; never bend sharply. \* \* \*

# **Clothing That Protects**

-From page 134

sparks do not adhere readily to chrome leather. It is the most durable material for protective clothing, and the most expensive.

Asbestos, long used for protection against fire, is used for a variety of protective garments, ranging from hand pads to complete suits. It is particularly useful for gloves worn for handling hot objects.

Underwriters' grade of asbestos, rather than the commercial grade, should be used. Cloth used for garments and accessories contains 80 to 85 per cent asbestos and weighsabout 2½ lbs. per square yard.

Aluminized fabrics owe their protective qualities to the thin aluminum coating that reflects 95 per cent of the radiant heat. This permits lighter and more flexible garments, allowing the wearer to work more freely and effectively. Underwriters' grade tropic weight asbestos can be used instead of the heavier material.

To provide oxygen for the wearer, self-contained breathing apparatus can be carried under the coat.

Aluminized garments are not recommended for exposure to direct or conducted heat. There is little heat dispersion, and the aluminum coating will melt under direct heat at high temperatures.

Aluminized garments designed for specific jobs are used in many industries, such as ceramic, metal-

# WHAT'S NEW AT WHEELER!



# **FPW**

FLAME-PROOF WASHABLE

- · SANFORIZED
- . ATTRACTIVE GREEN
- . SMART STYLING

New flame-proof, washable fabric retains its flame resistance thru 15 washings by laboratory tests! Longer life cuts replacement costs to the hone. Sheds sparks and light molten splash.

Wheeler F. P. W. coats have double thick collars, quick, release snap button fronts, no raw edges—all hemmed or overedged, and liberal overlaps to prevent gaps. Adjustable snap cuffs, Sizes extra liberal to promote free movement. Ask for latest flyer!

## REVERSIBLE GLOVE



A new five-fingered reversible asbestos glove for use on either hand. Ideal for many applications, this glove is available lined or unlined styles in Underwriter's grade Wheeler weave flameguard treated asbestos. The thumb is constructed so that the glove will fit comfortably on either left or right hand. Strong construction and tough Wheeler-Weave fabric make for longest wearing qualities.

ADJUSTING INSET STRAP

SELF-

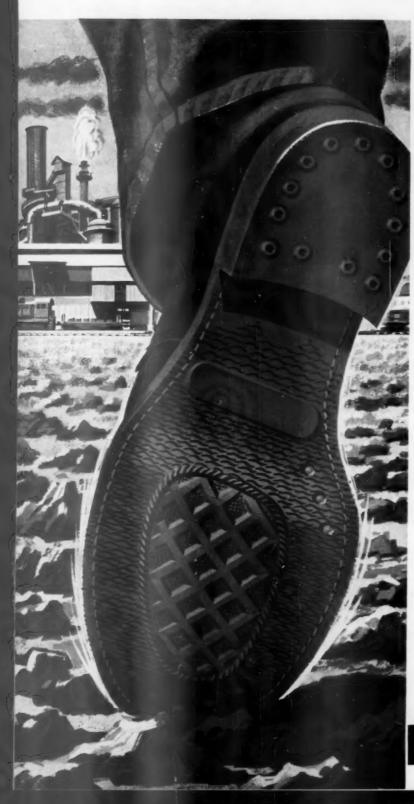
This new development in Wheeler's line of industrial leggings means comfort and safety. The spring tension chain strap readily adapts to any shoe and eliminates adjusting nuisance. Positively positions the flare on the top of the shoe to give maximum protection. Does not hamper the quick release feature of Wheeler leggings, available on conventional knee length (12" high) and also on spats and hip leggings.

SEND FOR NEW CATALOG

# WHEELER PROTECTIVE APPAREL, INC.

226 West Huron Street, Chicago 10, Illinois

# "We rely on neoprene soles to protect the reputation of Thom McAn work and safety shoes"





Mr. William J. Smith, General Manager Thom McAn Safety Shoes Division of Melville Shoe Corporation

As Mr. Smith puts it, "Our policy is to offer good design, comfort and wear by using materials equal to many different kinds of service. Both soles and heels must combine many wear-resistant properties; that's why we've used neoprene for 21 years."

During this time, neoprene soles have repeatedly demonstrated their resistance to oil, grease and chemicals. They've withstood high-temperature exposure, they've ended the cracking and stiffness problem in low-temperature service. Neoprene has also proved highly resistant to flex-cracking, cutting, gouging and scuffing.

With the help of this all-around performance, Thom McAn safety shoes have won a loyal following. They are now worn by workers in chemical plants, oil refineries, steel mills, quarries, service stations, and many other industries.

The reputation made by neoprene soles is important to companies like Thom McAn. Specify neoprene soles and heels . . . you'll find them a sales asset on all types of work and safety shoes. E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept., Wilmington 98, Delaware.



Better Things for Better Living
...through Chemistry

NEOPRENE

SYNTHETIC

working, and petroleum, as well as for rescue work. These are available from several manufacturers and distributors.

Protection Against Impact. Most garments provide some protection against cuts, bruises, and abrasions. Aprons of padded leather, metalstudded leather, or metal mesh are worn to shield the abdomen and groin. Kickback aprons, worn by saw operators, have a fiber shield for protection against kickbacks.

Laundry service. Laundered overalls, coveralls, aprons, smocks, and other garments are usually furnished by the employer where extreme cleanliness is required in plant processes or where toxic materials are handled. In many cities, industrial laundries provided a complete service.

Dust removal. Use of compressed air to blow dust from hair and clothing may cause serious injury to eyes and ears. Brushes or vacuum equipment should be provided for this purpose and the use of compressed air forbidden. \* \* \*

## The Welder's Clothing

Protective clothing is as much a part of the arc welder's outfit as his helmet. Ordinary cotton shirts and dungarees can be ignited quite easily. Garments of chrome leather or flameproofed duck may prevent serious burns.

Garments available include overalls, pants, chaps, aprons, jackets, sleeves, gloves, mittens, and spats.

Clothing should be of good quality material, solidly constructed. Fastenings must prevent gapping and should be so designed that the wearer can get out of the garment quickly.

There should be no turned-up cuffs or other projections to catch hot metal. Pockets should have flaps.



-From page 4

3. Where a large number of potentially hazardous materials may be handled infrequently, establish a schedule with specific requirements for each category of materials. Code orders so the supervisor can refer to the schedule and make sure all persons are adequately protected.

Standardize items. A list of approved equipment for various operations should be established. Equipment should be selected on the basis of design, performance, reliability of manufacturer, etc.

It is desirable to standardize items throughout the plant as far as possible. It is good policy to review the list periodically, modifying it as new and improved equipment becomes available.

Don't overprotect. This procedure is particularly desirable where the hazardous properties of materials vary widely. Requiring employees to be overprotected when handling harmless materials has a bad effect on morale.

Most operations in chemical plants should be surveyed and a combination of these steps utilized. Employees should be instructed as Circle Item No. 107—Reader Service Card—

National Safety News, March, 1959



WORKIN

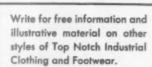
Jacket and Overalls may be purchased separately

Black all rubber work shoe, 6" height, blucher pattern, DURATEST cleat design outsole and heel, net lined, available with or without Steel Toe



out frayed edges developing.

as well as in combination.





PRODUCTS OF
BEACON FALLS RUBBER FOOTWEAR
BEACON FALLS, CONN.

Circle Item No. 106-Reader Service Card



to the precise equipment required during the various stages of opera-

Free or charge? Most companies issue personal protective equipment without cost to the employees, particularly when the item is not likely to be used off the job. This is natural, since if the company cannot provide a completely safe working environment, it should provide the necessary means for the employee to protect himself.

For certain equipment some companies pay only a portion of the cost. Notable examples are safety shoes and prescription safety glasses. This category generally includes equipment of a supplemental nature and supplied as a service to the workers.

Experience has shown that employees take better care of property in which they have a financial in-

The three greatest menaces to driving today are hic, hike, and hug.

# What Would We Do Without Plastics?

PLASTICS, a term which describes an enormous variety of moldable synthetic substances, provide the raw material for countless products used in modern living and in industrial processes.

These plastics have a wide range of characteristics. Some are transparent or translucent; others are opaque. They can provide tough, pliable films or hard shatter-resisting masses.

Many plastics have important uses in protecting the worker against accidental injury and occupational diseases. They are used for protection against falling and flying objects, corrosive and toxic chemicals, dusts, gases, vapors, and other injurious agents.

Transparent plastic with good optical qualities is used for goggles and face shields, even for corrective

Compounds can be made resist-

ant to oils, acids, and most organic solvents. Some are shatter-resistant, nonconductive of electricity, and heat and cold proof.

Some plastics are nontoxic, odorless, and tasteless and are suitable containers for food products. They can be molded to very close tolerances. Most of them can be produced in a wide range of colors.

Articles of safety equipment in which plastics are used include:

- 1. Goggles and face shields.
- 2. Hard hats.
- 3. Respirators, gas and dust masks.
- 4. Garments of plastic film or coat-
- 5. Containers for first aid kits.
- 6. Instruments for the dispensary.

Types of Plastics

Following is a list of the more common types of plastic materials with their properties and principal



# TARPS THAT TAKE A RENCHING IN SPARKS

... and go right on protecting

This photo shows a STA-SAFE Tarp at work in a large oil refinery where the constant threat of fire demands positive protection. Even after long use on outdoor welding jobs, and repeated exposure to oil, this STASAFE Tarp still gives the superior safety required. The weather has no effect on its flame resistance and oil, dirt and greases wash right off!

Regardless of the application, STA-SAFE Welding Tarps never lose their fire resistance. They last longer, cut your replacement costs to an absolute minimum.

For more information, write today for your bulletin StaSafe Welding Tarps

STANDARD SAFETY EQUIPMENT COMPANY

NEWARK 4, N.J. 604 BROADWAY

LOS ANGELES 66, CAL. 12921 W. WASHINGTON BLVD. CLEVELAND 10, OHIO 855 East 152nd St.

# Safety Insurance



Biltrite Safety Soles protect against more hazards . . . more comfortably. They are lighter, tougher... specially compounded for both safety and durability.



### BILTRITE SAF-T-STEP NEOPRENE CORK SOLES

- The one Neoprene Cork Sole that does not compromise wear for weight
- Resist oil, grease, chemicals and acids



# BILTRITE SUPER-LITE CORK SOLES

- Resist abrasion from grav-el, metal filings, etc.
- · Lightweight resilient . insulate against heat, cold and shock



# BILTRITE NYLON CORD NEOPRENE SOLES

- Rugged greater abrasion resistance
- · Added resistance to oil, grease, acids and chemicals



# **HEELS AND SOLES**

# NEOPRENE SOLES Resist oil, grease, chem-

BILTRITE SURESTEP

- icals, acids
- · Extra rugged for longwearing service

## **AMERICAN BILTRITE** RUBBER COMPANY

CHELSEA SO. MASS

#### BILTRITE TRU-GLIDE NEOPRENE SOLES

- · Provide extra traction and gliding comfort
- · Resist oil, grease, acids and chemicals

Warehouses: 4464 District Boulevard, Los Angeles - 1010 Gratiot Street, St. Louis In Canada: American Biltrite Rubber Co. (Canada) Ltd., Sherbrooke, Que.

argest producer of shoe soling materials producer of shoe soling materials produced and a soling materials produced and a soling materials are soling materials and a soling materials are soling materials.

Acrylles. Optical clarity, shatter resistance, weather resistance, machinability, wide color range.

Uses. Goggles, face shields, aircraft turrets, auto taillights, signs, brush backs. Dynel, Acrilan, Orlon textiles for work clothing.

Alkyds and Rosin Modifications. Good electrical insulation, heat resistance, dimensional stability, fast curing.

Uses. Paints, ignition parts, magneto rotors, linoleum surfacings.

Aminos (Urea and Melamine). Good electrical insulation, resistant to organic solvents, unlimited color range.

Uses. Buttons, dishes, laminated table tops, housings for kitchen appliances.

Cellulose Plastic Materials. Toughness, high impact strength, good electrical insulation, ease of fabrication, lustrous finish.

Uses. Frames for eyeglasses, irrigation pipe, display packaging, rayon and acetate textiles.

Coumarone—Indene and Petroleum Resins. Resistance to water and caustic cleaners, compatability with compounding ingredients.

Uses. Asphalt floor tiles, waterproof

coatings, aluminum paints, printing inks.

**Epoxies.** Excellent adhesion, resistance to chemicals and heat, can be cured at room temperatures.

Uses. Adhesives, surface coatings, transformer and motor laminates, printed circuit backing.

Fluorocarbons. Extreme resistance to solvents and corrosive agents, high impact strength, wide temperature range.

Uses. Chemical tubing, high temperature insulation, pump diaphragms.

Nylon. Good strength and toughness over wide temperature range, wear resistance, self-lubricating.

Uses. Gears, rope, brush bristles, slide fasteners, combs, nylon textiles.

Phenolic and other tar acid resins. Hard and rigid, good electrical insulation, low water absorption, good temperature range.

Uses. Protective hats, goggle frames, grinding wheels, plywood, telephone handsets, radio-TV cabinets, shell molding, dials.

Polyethylene. Inert to solvents, flexible and tough over wide temperature range, non-toxic, odorless, tarteless.

Uses. Coaxial cables, semi-rigid

kitchenware, squeeze bottles, packaging.

Polyester Resins. Weather-resistant, strong, formable with low pressure, compatible with many fillers.

Uses. Reinforced plastics for auto bodies, boats, transluscent panels, Dacron textiles.

Silicones. Extreme heat resistance, good dielectric properties over wide frequency range, low water absorption.

Uses. Insulation for generator coils, circuit breakers, waterproof coatings, auto polishes.

Styrene Resins. Lightest of commercial plastics, excellent moldability, tasteless, odorless, unlimited color range.

Uses. Lighting fixtures, wall tiles, refrigerator parts, kitchenware, toys, and novelties.

Vinyl Resins. Tough and strong, excellent electrical insulation, resistance to chemicals, oil and weathering.

Uses. Floor tile, protective garments, metal and fabric coatings, rainwear, pipe and pipe fittings, valves, electrical insulation, machine and structural parts.

Note: Data presented in this table were obtained largely from The B. F. Goodrich Co. and Bakelite Corp.



# THE SOLUTION TO AN OLD INDUSTRIAL PROBLEM

# Contact Dermatitis

SILCONEX (77% silicone) is the most universal skin ointment now available. It protects not only against water dissolved materials but also against solvents and oil-solvent—water—chemical mixtures. It resists exposure to strong acids and alkalis, oxidizing agents, salts and other chemicals whether in water or organic solution. It prevents initial sensitization by allergens. It is non-conducting and therefore useful in electronic operations. Simple to apply, one or two applications a day provide ample protection. It has an important place as the most universal weapon againt contact dermatitis.

CLEREX & H-R CREAM SOLVENT PROTECTION protect the skin against organic solvents. They wash off with soap and water. CLEREX is a gel which forms a continuous, strong, elestic skin-adherent film which does not interfere with tactile sensation. The film is insoluble in all anhydrous organic solvents, oils and greases. It protects against the hydrocarbons (benzene, benzol, toluene, gasoline, varsol turpentine, kerosene, solvent nephtha), the

chlorinated hydrocarbons, nitriles and the polymerizable monomers (styrene, acrylonitrile, and unsaturated esters for producing polyester resins). Used in making and using paints, varnishes, plastics, polyester resin—fiber-glass compositions. lacquers, inks, and in metal degreasing using trichlorethylene. H-R CREAM is a modification of CLEREX with a vanishing cream base. It is highly resistant to the materials listed under CLEREX. It is useful where protection must be applied to the face and arms as well as the hands. It has proven highly effective against phenolic vapors, creosote, extreme exposure to coolants, tars, rubber-asphalt and rubber-tar mixtures, petroleum oils, plastic and adhesive compositions.

VEREX—a general purpose barrier cream widely used in both the office and the plant, in the mechanical, textile, chemical, rubber and process industries—protecting the skin against ordinary exposure to coolants, dirt, grease, inks, cement, sulphur, rust, carbon black, etc. Protects against contact with poison ivy. Soothing to the skin. Washes off with soap and water.

# HYGIENE RESEARCH INC.

684 Broadway, New York 12, N. Y.

Literature and samples on request. Write Dept. N\$359

VISIT US AT BOOTH NO. 3 NEW YORK 5HOW

Circle Item No. 109-Reader Service Card



# INFORMATION FOR SAFETY DIRECTORS

about improved products and new services made possible by DU PONT CHEMICALS

# MORE COMFORT MORE SAFETY

in safety shoes and work gloves made of leather processed with

# DU PONT

Du Pont "Quilon" chrome complex is used by the tanner to process leather which has these important advantages for the wearer:

- Improved resistance to water. If wet due to long exposure, leather dries out soft and pliable-shoes maintain their original fit.
- Leather has increased resistance to acids.
- · Resists damage by perspiration.
- Leather pores remain open, allowing air to penetrate and keep feet comfortable.
- A permanent treatment—lasts for life of shoes.
- Greater comfort and safety for workers.

## WORK GLOVES WEAR LONGER-STAY SOFT AND EASY ON HANDS!

The same benefits that are important in safety shoes are equally desirable in work gloves. Wear tests have shown that longer wear is an added benefit.

Mail coupon for more information and names of suppliers whose products contain Du Pont "Quilon" chrome complex.

Next time you buy, ask for shoes and gloves of leather processed with DU PONT QUILON



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

# GRASSELLI CHEMICALS DEPARTMENT



	om N-2543, Wilmington 98, Del. and names of suppliers whose prod-
Name	Title

# THE BIGGEST, NEWEST IDEA IN INDUSTRIAL GLOVES!



# PVC Gloves by Jomac, job-proved for extra safety, extra wear

Check these advantages . . .

- Extremely tough—Last two to five times longer than ordinary industrial gloves
- Very flexible—Give greater dexterity than any other coated gloves. Made in sizes for maximum comfort
- Highly resistant—Nonflammable, nonoxidizing and resistant to practically all chemicals
   —will not crack or peel

Give your employees the maximum protection afforded by North PVC Gloves. There is a size to fit every hand—fit it comfortably, and in this way lessen fatigue and increase efficiency. You will find production going up, accident rate going down. Available in knitwrist, band top and gauntlet types—palm and partial back coated styles.

FREE OFFER—On your business letterhead, kindly furnish details of your working conditions—and we will send you a sample pair.

We also make a complete line of North PVC chemical and foul weather protective garments and the famous Jomac loop-pile industrial gloves, handguards and safety sleeves for hand-to-shoulder protection.



1600 SERIES. Fully coated, heavy duty.



1800 SERIES. North-Grip - Permruff surface; for handling slippery surfaces.

# JOMAC Inc

Dept. D, Philadelphia 38, Pa.

Associated companies and distributors throughout the world Circle Item No. III—Reader Service Card

# Fatigue Is an Accident Maker

WORK ACCIDENTS occur most often from 10 to 11 a.m. and 3 to 4 p.m. A good deal of the time, fatigue is one of the main causes.

Nowadays, the worker is not just physically tired. He can be braintired from conditions ranging from physical to psychological to environmental, and not all of these factors need be related to his job.

When a worker is tired out, his muscles and brain frequently miss connection in their coordination. He begins to make too many motions, overlooks details, and does not even realize it. The result is an accident.

Overtime is often necessary, and even desirable from an employee's financial standpoint. But, as World War II demonstrated, too much overtime procedures lowered efficiency, increased fatigue, and a lessening in quantity and quality of the item manufactured. And a worker endangers his own safety and that of others.

Whenever overtime is required, management should take extra precautions. These may involve adjustment of food and medical services, revised rest-periods, and renewed emphasis on safety procedures on the production and distribution lines during all shifts.

Rest periods. For monotonus and repetitive work a five-minute relaxation period in each working hour is recommended. For less intensive work, a rest period of 10 to 15 minutes in the middle of the first and the last half of each shift is suggested.

At these breaks, snacks and coffee, milk or soft drinks help to restore energy.

Rotating shifts. When plants operate multiple shifts, an attempt is made usually to rotate workers on day and night shifts, when possible. Some firms prefer to rotate shifts each two or three months, instead of every week or so, since the shorter period doesn't give the individual enough time to adapt himself to changed hours.

Health education. Through educational programs employees can

learn essentials of personal hygiene, nutrition, posture, recreation and relaxation.

Environment. Many factors, other than the job itself, affect a worker's resistance to fatigue. For instance, ventilation, lighting, noise, washrooms, drinking water, food service, use of color in the plant, and house-keeping are important.

Personal problems. The supervisor should try to prevent friction among workers and between employees and himself. Workers should feel their job is important. Employee counseling often is helpful from many considerations, including that of safety.

Placement. Work assignments should match the physical and mental abilities of the individual. Physical capacity can be determined by pre-placement and periodical medical examinations. Mental and emotional traits are hard to nail down, but much can be learned in a preplacement interview and during the first few days on a job.

## Combustibility of Natural and Synthetic Fabrics

Acetate. Ignites readily, melts and burns quickly but somewhat less so than rayon or cotton.

Acrilan. Ignites readily, melts and burns like cotton.

Cotton. Burns rather rapidly.

Dacron. Ignites with difficulty, melts and burns slowly.

*Dynel*. Difficult to ignite, melts but does not support combustion.

Nylon. Quite difficult to ignite, melts but does not support combustion.

Orlon. Ignites readily, melts and burns like cotton.

Polyethylene. Melts and burns very slowly.

Rayon. Ignites readily and burns rather rapidly.

Saran. Ignites with moderate difficulty, self-extinguishing, melts but does not burn.

Vicara. Burns rather easily but less flammable than rayon and cotton.

Vinyon & Vinyon N. Difficult to ignite, melts but does not support combustion.

*Wood*. Difficult to ignite, tends to be self-extinguishing.

# **GRO-CORD**

ST with Neoprene...

PARA-VINL!



PARA-VINL offers a proved SLIP RESISTANT DESIGN in a DENSE, PUNCTURE-RESISTANT material—with these "plus" features for the perfect safety/work shoe sole:

- highest abrasion (wear) factor on the market
- super oil resistance

soling material.

- excellent low temperature flex
- positive resistance to heat, acids and caustics

Molded Design Sole available in Black & Brown, 14 iron flat

Plain Molded Sale for dress-type safety shoes available in Black, Brown & Oak, 10½ iron flat.

Both Types of soles are available with matching heels. GRO-CORD RUBBER CO.

GRO-CORD RUBBER CO. of CANADA LTD, Tilhonburg, Ontorio

GC12

Circle Item No. 112—Reader Service Card

# "Extracoated" Edmont Gloves Wear 20% Longer



Neex No. 924 . . . one of 8 styles

FLEXIBLE NEOPRENE COATED: Edmont's exclusive reinforced DuPont neoprene is as flexible as plastic and far tougher than ordinary neoprene. Extracoated over-all for best all 'round resistance to solvents, caustics, oil, heat and abrasion. New, comfortable pattern with wing thumb and curved, pre-flexed fingers.



Redment No. 938 ... one of 6 styles

HEAVY DUTY NEOPRENE PROTEC-TION is provided by all-over Extracoating of reinforced neoprene. Job-fitted for handling in presence of oil, solvents, caustics, acids and heat. Wing thumb, curved fingers, seamless palm for maximum comfort.



Grab-it No. 60W ... one of 8 styles

POSITIVE NON-SLIP GRIP makes Grab-it the safest general handling glove on the market. Extracoated with tough natural rub-ber, welded to strong fabric. Outwears ordinary leather; outwears a dozen or more regular canvas gloves. Excellent resistance to cutting and abrasion.



Snorkel No. 404 . . . one of 4 styles

SUPER-FLEXIBLE LIQUID-PROOF GLOVES with sure, non-slip grip for wet or dry handling. Two-piece jersey liner. Extracoated with Edmont vinyl; has excellent resistance to oils, abrasion, many solvents. Wing thumb; curved, pre-flexed fingers and seamless palm for greatest working ease.



Werx No. 151 ... one of 4 styles

OUTWEARS CANVAS 5 to 1 and frequently outwears expensive goatskin. Special vinyl-impregnated fabric of this Werx glove gives excellent grip and dexterity, lets hands breathe. Lint-free and washable. Ideal for the inspection and handling of small parts, shipping and receiving.



Monkey Grip No. 36

JOB-FITTED FOR ABRASIVE WORK, Monkey Grip is Extracoated with Edmont's own tough vinyl plastic. Quality of the plastic is always uniform. Perfect hand-fitting pattern with wing thumb and curved, pre-flexed fingers. Also available with triple-thick coated palm for extremely abrasive service.



Grappler No. 363

EXCELLENT WET-GRIP CHARACTER-ISTICS. Extracoated with Edmont's exclusive heavy duty Durox. Outwears ordinary plastic coatings up to 50%. Grappler resists abrasion, snagging, many solvents. Wing thumb, curved, pre-flexed fingers provide comfort and ease of handling.

Edmont

FREE TEST OFFER TO LISTED FIRMS: Tell us your operation, material handled, temperature condition. We will recommend the correct glove and supply samples for on-the-job testing.

#### **EDMONT MANUFACTURING COMPANY**

1205 Walnut Street, Coshocton, Ohio

In Canada, write MSA, Toronto

Circle Item No. 113-Reader Service Card

# Living with the Atom

-From page 9

terials. One cannot assume that such materials will be sufficiently diluted if they are simply emptied down the drain. Under some circumstances burying waste products may also be highly hazardous. This would be especially dangerous if they were buried in a place where the materials could pollute underground waters leading to a public water supply.

The best solutions appear to be:

 Dilute solid or liquid wastes with sufficient volumes of non-radioactive isotopes of the same element to reduce the activity below hazardous levels.

 Concentrate the wastes to a small enough volume that they can be buried in containers, usually concrete blocks, which will erode away very slowly and thus release their activity to surrounding waters at a very low rate.

Radioactive gases or vapors, if above safe levels, should be filtered or absorbed from the waste air stream. Their disposal should be considered as carefully as the disposal of any other radioactive waste material.

Companies getting radioactive materials from the AEC may obtain advice and instruction from the Commission. Others may take advantage of the courses of instruction and advice available from large university research centers.

## Radiation Safety Course Announced

The successful course in Radiation for Safety Engineers, conducted at Council headquarters March 31 to April 4, 1958, will be repeated in 1959. The dates are May 4-8.

The course is designed for safety engineers in plants where radioactive materials are used, and is intended to give safety engineers the minimum understanding needed to evaluate hazards and apply control measures. It is *not* a course for health physicists or radiation specialists

Instructors will be from the Council staff, the Health and Safety Division of Argonne National Laboratory, the Atomic Energy

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Commission, and from industrial organizations.

The plan of the course will follow closely the plan presented in 1958, revised and improved as a result of critical study of the previous course. A feature will be a one-day visit to Argonne National Laboratory, where students will be given an opportunity to work with instruments under the direction of the Laboratory staff.

For information and application forms, write to Glenn Griffin, Director of Industrial Training, National Safety Council, 425 N. Michigan Ave., Chicago 11.

# The Safety Library

-From page 112

"Variation of the Trip Point in the ORNL (Oak Ridge National Laboratory) Type Safety System." J. L. Cockrell and C. W. Ricker. Electrical Engineering. January 1959. pp. 54-58.

#### First Aid

"Disaster Ambulance—Mobile First Aid Station." Thomas F. Neruns. Industrial Medicine and Surgery. December 1958. pp. 641-642. "Mouth to Mouth Resuscitation."

"Mouth to Mouth Resuscitation." Wm. D. Claudy. *Firemen*. December 1958, pp. 10-12.

#### Food Industry

"Stacking Bright." Food Plants Solve Old Problems with Pallets, Tough Tape for Stacking Cans." Pacific Factory. December 1958. pp. 24-25.

#### **Gas Industry**

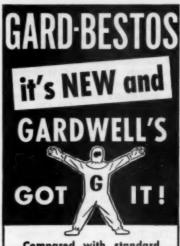
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#### Health

"Evolution in Chrysler Corporation's Medical Department." *Indus*trial Medicine and Surgery. January 1959. pp. 20-23.

"Immunization Against Influenza in Industry." Howard K. Edwards and others. *Industrial Medicine and Surgery*. December 1958, pp. 638-640.

"Industrial Thallium Intoxication." Edna M. Richeson. *Industrial Medicine and Surgery*. December 1958. pp. 607-619.



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"Newer Concepts of the Pathogenesis of the Pneumoconioses." O. A. Sander. *Journal of Occupational Medicine*. January 1959, pp. 7-11. (The 1958 Ramazzini Oration.)

"A Study of the Physiological Effects of Carbon Black." Carl A. Nau and others. AMA Archives of Industrial Health. pp. 511-520.

"Studies of the Effects on the Skin of Nickel and Chromium Salts." M. H. Samitz and Harry Pomerantz. AMA Archives of Industrial Health. December 1958. pp. 473-479.

"Toxicity of Phosphine, with a Possible Fatality from This Poison." R. N. Harger and Louis W. Spolgar. AMA Archives of Industrial Health. December 1958, pp. 497-504.

"The Toxicology of the Borones." George Roush. Journal of Occupational Medicine. January 1959. pp. 46-52.

#### Hospitals

"The Civil Defense Emergency Hospital for Disasters." Edgar M. Dunstan. Hospital Management. January 1959. pp. 38-39.

"Conductive Floors in the Hospital." Dave E. Smalley. Hospital Management. January 1959. p. 64.

"A Prevention Program Pays Off." John M. Fahey. Mental Hospitals. January 1959, p. 34.

"Safety Training Spreads Like Fire." The Modern Hospital. January 1959. pp. 67-69.

#### **Human Factors**

"Human Motivation and Accidents." Flanders Dunbar, *Industrial Bulletin*. New York Labor Department. December 1958, pp. 7-8.

**Lumber Industry** 

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"Cerro de Pascos Medical Division Charts Way to Better Health." Engineering and Mining Journal. December 1958, pp. 106-109.

"Checkpoints for Trackage Systems." *Mechanization*. December 1958. pp 69-70.

"Safety, Operations, Sales." Coal Age. January 1959. pp. 110-113. (A special report on the technical themes of the Coal Mining Institute of America's 72nd Annual Meeting.)

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#### Petroleum Industry

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#### **Printing and Publishing**

"Why Lord Baltimore Is a Safe Place to Work." H. H. Slawson. Modern Lithography. pp. 32-33.

## **Pulp and Paper Industry**

"Sonoco Products' New Corrugating Board Facilities." A.W. J. Dyck. *The Paper Industry*. December 1958, pp. 584-589.

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Pulp and Paper Magazine of Canada.
December 1958, pp. 242-245.

#### Radiation

"Some Toxic Effects of Yttrium and Lanthanum." Quentin L. Hartwig and others. AMA Archives of Industrial Health. December 1958. pp. 505-510.



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"Interpretation of Regulations Governing the Shipment of Radioactive Material." Carl W. Buckland, Jr. AMA Archives of Industrial Health. January 1959. pp. 33-43.

#### Railroads

"This Coal Dock Works Fast." Railway Age. January 12, 1959. pp. 24-26. (The Chesapeake & Ohio's new \$7,000,000 loading facility at the Presque Isle docks in Toledo is said to be the largest and fastest in the world.)

#### Rubber Industry

"Advantages of Wooden Pallets for Handling Rubber Products." William H. Sardo. Rubber Age. December 1958. pp. 444-447.

#### Supervisors

"Your Stake in Safety." Textile World. January 1959. p. 83.

#### ADDRESSES OF MAGAZINES MENTIONED

Readers are asked to send their requests for copies of magazine articles to the publishers. The NSC Library is unable to fill such orders. AMA Archives of Industrial Health, 535 N. Dearborn St., Chicago 10.

Agricultural Chemicals, P.O. Box 31, Caldwell, N. J.

American Gas Association Monthly, 420 Lexington Ave., New York 17.

Aviation Week, 440 W. 42nd St., New York 36.

Canadian Mining Journal, Gardenvale, Que., Canada.

Coal Age, 330 W. 42nd St., New York 36.

The Constructor, Munsey Bldg., Washington 4, D. C.

Electrical Engineering, 33 W. 39th St., New York 18.

Engineering and Mining Journal, 330 W. 42nd St., New York 36.

Firemen, 60 Batterymarch St., Boston 10, Mass.

Hospital Management, 1319 F St., N. W., Washington 4, D. C.

Industrial and Engineering Chemistry, 1155 Sixteenth St., N. W., Washington 6, D. C.

Industrial Bulletin, New York State Department of Labor, 80 Centre St., New York 13.

Industrial Medicine and Surgery, 400 SW. 69th Avenue, Miami, Fla.

Section 6—Personal Protection—Part 2

Journal of Occupational Medicine, 28 E.

Jackson Blvd., Chicago 4.

Mechanical Contractor, Suite 570, 45 Rockefeller Plaza, New York 20.

Mechanization, Munsey Bldg., Washington 4, D. C.

Mental Hospitals, 1785 Massachusetts Ave., N. W., Washington 6, D. C.

The Modern Hospital, 919 N. Michigan Ave., Chicago 11.

Modern Lithography, P.O. Box 31, Caldwell, N. J.

National Engineer, 176 W. Adams St., Chicago 3.

Pacific Factory, 709 Mission St., San Francisco 3.

The Paper Industry, 431 S. Dearborn St., Chicago 5.

Petroleum Week, 330 W. 42nd St., New York 36.

Pulp and Paper Magazine of Canada, Gardenville, Que., Canada.

Railway Age, Orange, Conn.

Rubber Age, 101 W. 31st St., New York 36.

Textile World, 330 W. 42nd St., New York 36.

Wood and Wood Products, 59 E. Monroe St., Chicago 3.



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NW-31	Light	Straight	101/2"	
NW-32	Medium	Straight	11"	
NW-41	Heavy	Straight	12"	
NW-51	Heavy	Straight	14"	
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- Job Description Form For Free Hand **Protection Analysis**

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## Protection for **Electrical Workers**

Special tools and protective equipment have been developed for linemen and generating station employees. Operating conditions vary but certain items are standard.

Tools used near energized equipment should be designed for the job and insulated to minimize the danger of shock to the operator. Insulation on tools alone, however, is not adequate protection near high voltages.\*

Items in common use include:

Linemen's rubber gloves Leather protector gloves Rubber line hose and blankets Linemen's belts and safety straps Climbers Rubber coats Tool pouches Tool buckets Fuse pullers Switch sticks Insulated stools Switchboard mats

Protective hats of insulating plastic or fiberglass are becoming standard equipment for linemen.

Regular and thorough inspections should be provided for all protective equipment. Defective items should be replaced immediately.

Brooms, brushes, and other cleaning equipment used around energized equipment should be free from metal. Insulating handles of tools should be kept clean and dry and only nonconducting preservatives used on them.

Metal ladders should not be used around electrical equipment.

In emergencies where areas are wet, wood platforms or insulated stools should be used or rubber boots should be worn by maintenance workers.

\*See Specifications for Rubber Protective Equipment for Electrical Workers, ASA Series J6.

# Clean Up After Work in Corrosive Atmospheres

When personal protective equipment is worn in a corrosive atmosphere, set up a rigid procedure for care of it after use to prevent contact with contaminated parts.

Before removal, even though it has not come in contact with corrosive chemicals, wash equipment thoroughly with a hose stream.

Remove boots, coats, aprons, and hats—then gloves. This is the logical order of removal if the coat has been put on properly with the sleeves outside the cuffs of the gloves.

Wash hands thoroughly before removing face shield and goggles. Then wash hands and face thoroughly again. A shower and change of clothing are better.

# Consultation Corner

Questions are answered by mail, a few of general interest being selected for publication here

By L. C. SMITH

Industrial Department, NSC

# Extinguishing Fires with Chlorobromomethane

Question: What information do you have on chlorobromomethane? What are its fire extinguishing qualities? Is it toxic?

Answer: Fire extinguishers containing chlorobromomethane are available in a number of sizes. Some types are small and compact and may be carried in the glove compartment of an automobile. Chlorobromomethane is a vaporizing liquid fire extinguishing agent.

It was used extensively during World War II for built-in extinguishers on aircraft and is presently used in aircraft for built-in extinguisher systems for engines. It is effective on Class B and Class C fires.

This vaporizing liquid is considered dangerous because of its toxic properties. When used on a fire, it decomposes and produces traces of hydrobromic acid, hydrochloric acid, and carbonyl halides, including phosgene and bromophosgene. These are all toxic materials.

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Its extinguishing qualities are

principally the same as those of carbon tetrachloride. Also, the precautions that are necessary when using this material are the same as when using carbon tetrachloride. This extinguishing agent should not be used in a small enclosed or unventilated area.

In summary, chlorobromomethane is toxic, particularly when it decomposes as it does when used on a fire. Persons using this material as an extinguishing agent should be familiar with its characteristics.

## **Oxygen Cylinders**

Question: In all instructions for handling oxygen cylinders there are cautions urging the user not to get oil or grease on the valves and fittings. Will oxygen in contact with oil or grease cause an explosion, or does there have to be a separate source of ignition? Answer: Pure oxygen will not burn or explode, but it does support and accelerate combustion. However, oil or grease will often ignite violently when in contact with oxygen under pressure. There does not have to be a separate source of ignition.

Oil and grease should never be permitted to come in contact with the valves, regulators, and gauges of oxygen cylinders. The valves of oxygen cylinders are usually lubricated by the packing and do not need other lubrication.

Valves and valve fittings used for oxygen service, unless manufactured and cleaned expressly for that purpose, should be cleaned with an inorganic cleaning material to make certain there is no oil or grease present.

Contaminated valves and fittings may be cleaned by boiling with a 10 per cent caustic soda solution. When oxygen is piped through carCircle Item No. 123-Reader Service Card



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TO PROTECT FINGERS
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Takes heavy duty use and abuse. Moulded in
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## NEW JERSEY SAFETY EQUIPMENT COMPANY

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Circle Item No. 124—Reader Service Card
National Safety News, March, 1959

#### COMPRESSED GAS CYLINDERS (Handling and Storing)

Handling compressed gas cylinders is a two-man job.

 Consider each cylinder as full. Handle it accordingly.

If handling oxygen cylinders with gloves, wear gloves free of oil or grease.

 Keep acetylene cylinders on end.
 When transporting cylinders, block or tie them securely.

5. Lift, don't slide, each cylinder from a truck. Avoid bumping the valve-protecting

Use a cradle or holder when lifting cylinders with a crane; never use a magnet.

7. Rolling cylinders is dangerous; use a

8. Never use compressed gas cylinders as rollers for moving heavy material.

 Store cylinders securely so they cannot fall or be struck, and where they cannot come in contact with salt, corrosive chemicals, or fumes.

10. Avoid exposing cylinders to heat or sun. Don't place them near flammable materials.

bon steel pipe, the pipe should also be free of oil or grease.

When hose is used for supplying oxygen under high pressures, care must be exercised to keep the hose from becoming contaminated with oil or grease. When making connections and repairs to such a hose, personnel should wear clean gloves to make certain no oil or grease has a chance to come in contact with the oxygen.

In brief, oil or grease in contact with oxygen under pressure is dangerous since only a small amount is highly explosive.

## Recommendations for Auto Seat Belts

Automobile seat belts have proved their value in preventing death or serious injury in many a crash. But the protective value of the belt will depend largely on the quality of the belt and method of installation.

The variety (and varying quality) of belts on the market today makes it advisable to buy from a reputable dealer. The Automotive Crash Injury Research Group at Cornell University recommends that:

1. Loop strength of belt and buckle be at least 3,000 lbs.

2. The belt be at least 2 in. wide.

Only one person be supported by a belt.

4. The buckle be simple to operate and easy to release.

5. The belt be anchored to the car.

The belt be anchored to the car frame, not the seat.

Seat belts must be comfortable and convenient to use, and be worn at all times. For maximum protection, they should have not more than 4 in. of slack—not too tight or too loose.

# ASA to Revise Construction Code

The American Standard Safety Code for Building Construction (A 10.2-1944) is to be revised and its scope enlarged to include highway and heavy construction. The American Standards Association Sectional Committee on Safety in the Construction Industry has made the following recommendations:

That the scope of the committee be broadened to include all phases **Heat Problems?** 

Fyrepel Fire protective clothing offers the best solution

# Wherever there is heat.

There is much delay and costly down time if repairs are involved. Fyrepel gets the job done much sooner. Routine inspections can be made regularly to head off shutdowns and tie-ups in production.

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Fyrepel's aluminized glass cloth fire fighting clothing has been proved Best by Test in demonstrations throughout the country.

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Fyrepel sleeves, aprons and hoods offer maximum safety and efficiency in the labs where hazardous ingredients are handled.

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of construction-building, heavy, and highway.

That subcommittees be formed to deal with various technical aspects of the different phases of the indus-

"The objective of the Sectional Committee is to develop a workable and enforceable code that can be adopted by authorities in all states," said Frank Boodro, the committee chairman.

"At present, contractors working in different states, or even in different areas of one state, may find themselves subject to contradictory safety codes. This is confusing and costly. The committee hopes to be able to develop a uniform code that is acceptable to all interested groups and authorities."

Mr. Boodro, safety director for B. Perini and Sons, Inc., Framingham, Mass., represents the National Safety Council on ASA Sectional Committee A10. The National Safety Council and the American Institute of Architects are joint sponsors of the sectional committee.

## When a Person Falls

When a person falls, some bystanders can't resist the impulse to help him to his feet. This might be the worst thing you could do for him.

Even an apparently simple fall may result in a hip fracture. In such a case, unnecessary movement may displace bone or damage nerves, blood vessels, or muscles.

World War I taught an important lesson: don't move a wounded person until sure that no bones are broken. In case of fracture, "splint 'em where they lie."

Inexpert lifting may lead to internal injuries or hemorrhage. The worst form of transportation is the back seat of an automobile. A truck is much better, if no ambulance is

While waiting for an ambulance, the first-aider should keep the patient as comfortable as possible and prevent further injury through movement of injured parts. One of the important things of first-aid training is learning what not to do.

Circle Item No. 130-Reader Service Card

## Waterproof Covers for Men and Materials

Waterproof covers often are needed to protect materials and equipment against water damage in case of fire. These covers are also useful for other emergencies, such as breaks in piping or when rain enters through broken windows or torn roofing during a windstorm.

Waterproof covers are especially useful in buildings where machinery, equipment or stock may be damaged by water. Such stock includes textiles, paper goods, hardware, foodstuffs, dry chemicals, leather goods, furniture, and other high-value materials. Areas in multistoried buildings where floor leakage is likely should have waterproof covers.

Approved covers of rubber-coated or chemically treated water-resistant canvas come in sizes up to 24 x 36 ft. They will last years if stored away from heat. They should be refolded regularly to prevent cracking along the folds.

Vinyl plastic sheeting is used for some purposes. These covers are nonconductors of electricity and are transparent enough to see the work. They are used sometimes by publicutility companies for protecting linemen's repair work. They are also used for covering boats and trucks and for other specialized uses.

Watchmen and responsible plant employees should be instructed in prompt use of covers.

#### **Material Storage**

Proper storage of materials, tools, and parts is simply good housekeeping—common sense arrangement of all items that go into an operation.

There are two main points to remember: Items must be piled and arranged so that, first, they can't fall and, second, they're readily accessible and can be handled easily.

Pile material so it won't fall down on somebody, and store it out of the way of traffic. Pick a storage spot that doesn't create a hazard for plant traffic or require crossing heavy traffic lanes to reach it.

Don't pile lumber where you have to cross a heavily traveled plant roadway to get to it. Pile it in the open, with access from all sides, where boards can be handled easily.

Seven important points are:

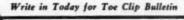


# . AND IT FELL ON HIS COMPROMISE



The finest in foot protection is a pair of safety shoes, but you probably have at least one man in your plant who doesn't wear them.

For him the best compromise is StaSafe Toe Clips, impact resistant steel clips that can be permanently nailed or temporarily fastened directly to his work shoes. Lightweight and low cost StaSafe Toe Clips combine comfort with protection.





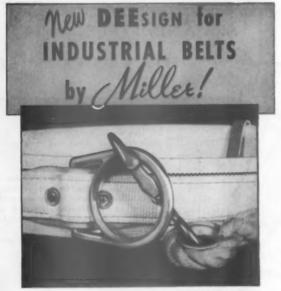
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WRITE DEPARTMENT 157

EL EQUIPMENT COMPANY, INC.

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1. Give each pile a firm foundation, and start it right.

2. Don't pile material too high for

safe lifting and handling.

3. Allow ample room for passageways. Observe clearance rules at aisles, sprinkler heads, and railroad tracks.

4. Keep the path to fire-fighting equipment unobstructed. Keep fire doors clear.

5. Cross-tie tiers, when possible, so they support each other.

6. When the pile might be insecure, interlock the tiers with long boards.

7. Observe safe load limit of floor.

## Strains, Sprains Are Disabling

A fracture is always treated with respect. Unfortunately, there is a tendency to regard any injury in which no bones are broken as something trivial.

Neglect of sprains or strains will aggravate and prolong pain and disability. A lame back, wrist, ankle or any painful joint or extremity should be examined and treated without delay. The injury may be more than a strain-a fracture, a slowly developing chronic infection, a disease of the joints, or a sign of trouble at some distant joint.

Injuries in which the skin is not broken are more easily disregarded than those in which wounds are present. There is a great temptation to work off a sore back or knee. But just as important as in the case of open wounds, resting the strained part is essential.

A sprain or strain is actually a wound-a tear of muscles or ligament, although usually not all the way across the ligament or muscle. This tear must heal solidly before pain will disappear and strength return

## Germicidal Lamps Need **Special Fixtures**

Germicidal lamps must be used in fixtures designed for them. When erroneously bought for general lighting, or installed incorrectly, they will not function effectively and the invisible ultraviolet energy generated by them can be harmful.

The wrapper on each lamp warns the purchaser not to look, or even glance, at the lighted lamp.



#### IN SECTION 7

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BETWEEN farm, forest or mine and the ultimate consumer every product has been handled many times—by the producer, processor, wholesaler, retailer, and transportation agencies.

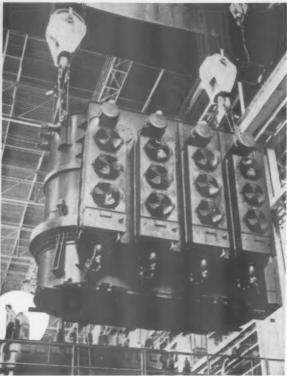
Materials handling is one field in which operating departments and safety departments have a very obvious interest in common. Both are interested in cutting down the number of handling operations, both for lower costs and for reduced exposure to accident.

Mechanical equipment avoids many of the hazards associated with manual handling, largely reducing the exposure and preventing strains, blows, and abrasions.

But mechanization introduces some new hazards, although modern equipment is built to move heavy loads without failure and is remarkably free from inherent hazards. To use mechanical equipment safely, study plant processes and handling methods. Then select your equipment and train men in its safe use.

331313141





### Why different loads require different slings

Your rigger knows that different loads need different slings because of varying factors such as shape, weight, material, finish, protruding sharp corners, extremes of temperature.

On some jobs chain is best. On others the characteristics of wire rope make it the first choice. On still other jobs, wise riggers know that combinations of chain and wire rope will provide the greatest lifting economy.

No matter what type is called for, you can be sure of the safest slings and the best values in ACCO Registered Slings. From this one source you can get unbiased information based on actual know-how.

And you can get the exact slings your rigger should have.

One of the recent improvements is the new shaped Master Link now provided without extra cost on all Acco Registered Slings, chain or wire rope. This link gives 18% greater resistance to distortion with no increase in weight. It is another reason why acco Registered Slings are recognized as the standard of efficiency and safety.

All Acco Registered Slings are prooftested, registered and identified for your greater assurance of safety.

Tell your distributor you'd prefer Acco Registered Slings.

#### WHAT "ACCO REGISTERED" MEANS

- 1 The best material
- 2 Unit safety factor (on bodies, rings, links, hooks)
- 3 Proof test of complete sling to twice the working load limit
- 4 Actual field service test of each design
- Metal identification ring or tag on each sling
- 6 Signed Registry Certificate with each sling

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BRIDGEPORT, CONN.

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Circle Item No. 133-Reader Service Card



## **Analyze Materials Handling**

#### It affects every phase of operation

ANY TIME a worker picks up or puts down or moves in any combination of horizontal-vertical planes, whether with manual or mechanical handling methods, he risks an accident. Prevention of such sprains, strains, back injuries, contusions, and fractures is a part of materials-handling safety.

Several methods can avert such mishaps. Use mechanical handling devices, where possible. Train operators of equipment. Train men who handle objects manually in the safest, easiest methods. And assign men who are physically fit for such work through pre-employment examinations and job studies.

Manual movement. When an object is to be moved manually, its weight is the important factor. Height to be lifted and distance to be traveled also are important. Environmental conditions may bring exposures that cannot always be predicted.

Mechanical movement. When mechanical power lifts and propels the weight, height to be lifted and distance to be traveled are the important factors. The greater the distance traveled with the load, the greater the chance of dropping it or colliding with another object.

#### **Exposures** in Manual Handling

Simple equipment is often needed for manual lifting and transporting. Training, supervision, and housekeeping will control these:

- 1. Incorrect lifting and carrying techniques.
- 2. Attempting to lift weights beyond the worker's capacity.
- 3. Lack of coordination among workers lifting together.
- 4. Cluttered aisles, floors and stairs.
- Failure to use equipment provided.
- 6. Showing off.

#### **Exposures** in Mechanized Handling

Mechanized handling equipment also poses safety problems. When

such devices are used, strains are minimized but falling object and collision accidents (with crushed hands and feet) may increase signi-

Injuries from operation of mechanical devices may usually be traced to:

- 1. Objects falling from carrier.
- Inadequate training of operators.
- 3. Faulty plant layout.
- Horseplay,
- Devices inadequate for the job.
- 6. Failure to use available equip-
- Poor housekeeping.
- Excess handling between opera-

#### Organization for Handling

Purchase of an industrial truck or a handling device is not sufficient to bring any significant reduction in accident frequency. An organized plan should cover:

- 1. Study of accident occurrence.
- 2. Determination of location and types of accidents.
- Inspection of conditions and study of causes of accidents.
- Correlation of accident data and inspection findings.
- Preparation of management report.

#### **Basic Equipment for Handling Materials**

TWO FACTORS will decide the methods of handling materials and the equipment used.

- 1. Does material move in more or less continuous flow and in fixed paths? Operation will then require such equipment as conveyors, traveling cranes, railroads and elevators.
- 2. Are goods moved intermittently between many points in plant and yard? This is the more common situation in industry and many types of portable handling equipment permit flexibility in handling operations.

Portable equipment, hand and power operated, is needed in every plant. In the smaller shops it may serve all needs. In larger plants these devices are useful auxiliaries to fixed systems.

This section is concerned chiefly with the more common portable devices, including:

- 1. Wheelbarrows.
- Hand trucks.
- Hand lift trucks.
- Powered hand trucks.
- Industrial power trucks.
- Tractors and trailers.
- Hoists.
- Cranes.
- 9 Conveyors.
- 10. Slings-wire rope, chain, fiber rope, and accessories.
- Miscellaneous equipment, skids, pallets, tote boxes, dollies, clamps, bridge plates, crossover bridges.

#### **Load-Bearing Parts**

Wire rope, chain, and fiber rope are important wherever loads are lifted or hauled. These products are built to meet exacting specifications, and their capacities are listed according to size, material and type of construction.

Slings made of these materials and attachments, such as hooks, and

#### References-Materials Handling, General

#### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

Materials Handling Accidents; Safety

Dock Plates and Gang Planks; Data Sheet D-318.

Steel Strapping; Data Sheet D-315. Skids; Data Sheet D-260.

#### National Safety News

Materials-Handling Equipment in Action; J. R. Clemens, Apr. 1951.

Looking Over a Mechanized Foundry;

F. B. Skeates, June 1951. Standardization's Neglected Field; Nathaniel Warshaw, June 1954.

Automatic Units in an Automatic Factory; F. R. Swanson, May 1955.

How About Hoists? B. J. Povolny, Jan.

Planning for Safer Materials Handling; Richard J. Sweeney, Nov. 1956. Hoist Inspection Simplified; Dec. 1957.

Rx for Safe Materials Handling; Feb.

Handbook of Rigging; W. E. Rossnagel, McGraw Hill, 1950.

Material Handling, Principles, Equipment and Methods; Harry E. Stocker, Prentice-Hall, 1951.

Materials Handling Handbook; sponsored by American Society of Mechanical En-gineers and American Material Handling Society, Ronald Press, 1957.

rings, are designed to meet the needs of every hoisting job.

These parts are subjected regularly to heavy loads, sometimes overloads. They should be selected for the needs of the job and kept serviceable by regular inspection and maintenance.

#### Unit Loading

Assembly of loads on skids, pallets or trailers to be moved from one part of the plant to another means less handling and more pieces per each handling. To move the load, it is only necessary for the truck to slide the platform or fork under the skid or pallet or to hook a tractor to the trailer.

A skid is a platform elevated from the floor by legs, casters, or special attachments.

A pallet is a development of the platform skid. The most common type is the double-faced wooden pallet with sufficient clearance between top and bottom to insert the forks of a fork truck for moving.

Clamps of various types add to the usefulness of fork trucks. These can move and pile drums, bales, and cartons without use of pallets.

Steel strapping provides a secure method of fastening bundled materials and for reinforcing packing cases. Workers need training in application and removal, and should wear goggles and leather palm gloves for the work. Equipment available from suppliers should be used for applying and removing strapping.

#### References-Wire Rope

#### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

Steel Sinews; Safety Reprint No. 5.
Recommended Loads for Wire Rope
Slings; Data Sheet D-380.

#### National Safety News

How Safe Are Your Slings; W. C. Richards, Aug. 1953.

You Can Depend on Wire Rope; Sept. 1954.

Lifting Safely with Wire Rope; T. O. Aho, Nov. 1955.

Let's Be Practical About Sling Loads;

H. M. Wilson, May 1956.

How About Hoists? B. J. Povolny, Jan.

Abrasion Wrecks Wire Rope; Dec. 1958.

## Wire Rope and Slings

WIRE ROPE has many qualities which make it suitable for heavy lifting and haulage and for supporting rigging.

It has high tensile strength and moderate flexibility and is resistant to varying weather conditions. It is available in a variety of grades, constructions, and sizes to meet every industrial requirement.

In spite of its strength and ruggedness, wire rope needs careful handling and maintenance for long, safe service. It should not be exposed to excessive heat or corrosive substances nor dragged over rough surfaces.

In selecting wire rope, consider these factors:

- 1. Size.
- 2. Construction.
- 3. Grade.

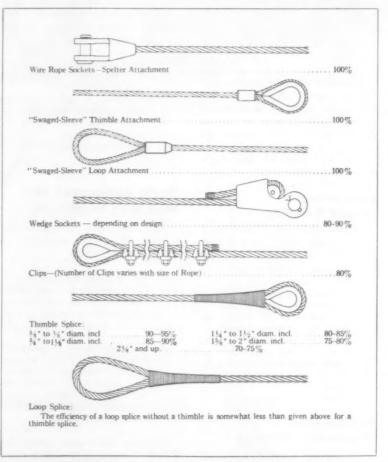
- 4. Equipment on which rope is to be used, conditions of service.
- Handling, installation, and maintenance.

Every user of wire rope should have a file of catalogs of the leading manufacturers. These are much more than catalogs. In addition to listing types available, they give much useful information on use and maintenance.

#### Constructions

There are many types of construction, each with its own particular advantages for certain service conditions.

In describing construction, the first numeral indicates the number of strands in the rope; the second, the number of wires in each strand.



TYPES OF ATTACHMENTS and how they affect the catalog strength of wire rope.

This is followed by a term describing the geometric arrangements of wires in each strand, such as 6 x 19 Filler Wire.

The 6 x 19 construction is the most generally useful. As the number of wires per strand increases, flexibility and reserve strength increase, but ability to withstand abrasion decreases. A 6 x 7 construction has higher resistance to abrasion but less flexibility.

The core serves as a foundation for the strands. Three types of cores are used: (1) fiber (2) independent wire rope and (3) wire strand.

Fiber gives elasticity to the rope and has adequate strength for normal operating conditions.

Metal cores are used where maximum strength and minimum stretch are important; where heavy loads or overwinding on a drum causes excessive pressure of strands against the core, or where temperature would dry out a fiber core.

Type of lay. There are two general methods of laying up rope:

1. Regular lay. Wires in the strand are laid in the opposite direction to that of the strands in the rope, so that on the outside of the rope the wires lay approximately parallel to the rope axis. Regular lay is standard. It is easier to handle during installation and is less susceptible to kinking.

Lang lay. Wires and strands are laid to the same direction. It has good flexibility and fatigue.

Herringbone is fabricated of 2 pairs of Lang lay strands separated by 2 strands of regular lay. This new construction is said to combine the flexibility and abrasion-resistant characteristics of Lang lay rope with the structural stability of regular lay. At present herringbone ropes are of the 6 x 37 construction and are preformed.

Wire rope is made either right or left lay. In most cases it makes little or no difference which type is used. Right lay is standard.

#### **Rope Grades**

Rope wires usually are made of the following materials and designated by their names (Minimum tensile strengths are quoted from Federal Specifications RR-571a):

Improved plow steel. Has highest strength and toughness and most

#### HAZARD SPOT CARD

For Job Planning and Instruction

#### WORK AREA

Footing: uneven | obstructed | slippery |
Cramped quarters |
Exposure to traffic |
Innecure piles or overhead material |
Inadequate illumination | glare |
Temperature: too hot | teo cold |
Exposure to gases | dust | fumes |
Hazards from nearby operations |

#### MACHINERY

Point of operation: cutting shearing punching abrading flying material
Power transmission: shofts belts gears pulleys electrical conductors
Unsafe storting and stopping mechanisms

#### TOOLS

Wrong tool for the job 
Tool in unsafe condition 
Tool placed in unsafe position

#### HANDLING MATERIAL

Material or objects: heavy | unwieldy |
rough | sharp | hot | corrosive |

Unsofe handling equipment: trucks |
conveyors | hoists | containers |

NSC Safety Instruction Card No. 775

wear-resistant properties. Most frequently selected for heavy-duty service, as in deep shafts and on excavating machinery. Minimum tensile strengths, 218,000-244,000 psi.

Plow steel. Strength about 15 per cent less than improved piow steel. Serviceable for haulage, hoisting, logging, and miscellaneous service. Minimum tensile strengths, 190,000-212,000 psi.

Mild plow steel. Combines toughness with pliability, making it capable of undergoing repeated impact stresses. Used principally for cable tool drilling. Minimum tensile strengths, 165,000-184,000 psi.

Cast steel. Where strength is not the controlling factor, its pliability is important to long life. Resistant to acid mine water.

Traction steel. Used in hoisting ropes for traction-type elevators. High resistance to bending fatigue and minimum abrasive action on sheaves and drum. Minimum tensile strength, about 160,000 psi.

Iron. Low tensile strength (about 70,000 psi.) but ductible. It has been used principally in elevator service where it is being replaced by traction steel.

Corrosion-resisting metals. Where corrosion is a factor, stainless steel,

bronze, and monel metal are used frequently. All-metal ropes are preferred to fiber-core ropes.

Stainless steel is used in marine operations, on aircraft, and where rope is exposed to alkali, acids of an oxidizing nature, (such as nitric), neutral brine, food products, and temperatures damaging to carbon steel ropes.

Bronze is slightly stronger than iron rope. It is used frequently in marine service.

Monel metal is used where rope is exposed to marine atmospheres, acids of a reducing nature (such as sulfuric, muriatic, and hydrofluoric), neutral brines, food products, pickling solutions, and aromatic chemicals.

Corrosion-resisting ropes are furnished in complete assemblies and slings with fittings attached. Temperature, humidity, nature and concentration of corroding chemicals should be considered in selecting equipment.

#### **Preformed Ropes**

A preformed wire rope is one in which each individual strand, and at the same time each individual wire, is permanently formed into the helical shape it will assume in the finished rope. Advantages of preformed rope are:

- Higher resistance to bending fatigue.
- 2. Greater flexibility.
- Less susceptible to kinking and therefore easier to install.
- More equal distribution of load on each strand and wire.
- More resistant to whipping and vibration.
- Hugs small drums better and winds more uniformly and smoothly.
- Operates over sheaves with less rotation around its axis, with less wear on rope and sheaves.
- May be socketed with less danger of unbalancing the lay of the rope below the base of the socket.
- Does not unravel when seizings are removed from ends of rope.
- When outer wires break through fatigue, they do not protrude or "porcupine." This reduces risk of injury in handling.

Since broken wires are less conspicuous in preformed rope, greater care is needed in inspection. However, broken ends separate slightly, permitting detection.

-To page 209

## **Chains and Slings**

CHAINS AND SLINGS are workhorses for industry. They combine strength, flexibility, and resistance to heat, impact, and corrosion. This versatility allows a range of uses from light hand hoists to huge cranes that can pick up heavy machinery.

For almost every hoisting and hauling effort, there's a chain, and attachments suitable for many projects can be obtained, or complete slings may be purchased.

Specifications for various types of chain have been compiled by the American Society for Testing Materals. Safe loads may be determined from tables in manufacturers' handbooks.

Safe working load means the maximum load which should be applied to a chain in direct tension.

**Breaking loads** are of no practical interest to the user. They are often misleading and may encourage unsafe practices.

Proof test means the actual test in pounds applied to the chain and attachments before leaving the factory. Proof-test figures should not be considered safe working loads.

The above tests are followed by visual link-by-link inspection by experienced inspectors.

#### Types of Chain

Conditions under which chain will operate should be considered during selection. When ordering, the manufacturer should be consulted about applications.

Factors to be considered are: impact loading, bumpy craneways,

rapid lifts, sudden stops, heat, and corrosive atmospheres.

Types commonly used in industrial operations are:

Wrought iron chain (crane or dredge) has high resistance to shock fatigue and corrosion. This chain has close links and is used for slings, hoists, cranes, power shovels, and marine purposes where human life and property depend on its endurance.

Welded steel chain (low carbon) is made in three common types: Proof Coil, BBB, and Steel Loading.

Proof Coil is used principally for towing, binding, logging, and similar operations. Links are comparatively long. Proof coil chain is not suitable for lifting or for slings.

BBB Coil is a higher grade than proof coil, with safe working load about 25 per cent greater. Shorter links give greater flexibility. BBB coil chain is not suitable for lifting or for slings.

Steel loading chain has a tensile strength about 50 per cent higher than BBB. It is used in the logging industry for binding and loading logs and in oil fields for handling pipe and heavy equipment.

High-test chain (high carbon) is heat-treated to give it high tensile strength and resistance to impact loads. Tensile strength is almost double that of ordinary steel chain. Ductility is moderate. Where resistance to wear is most important, it permits use of smaller and lighter chain.

Alloy steel chain (general purpose) has exceptional strength for weight and size, is resistant to some types of corrosion, and frequently is used where maximum tensile strength and resistance to abrasion—with reasonable resistance to impact—is required.

Special purpose alloy chain is considerably higher in cost and is used on high-temperature operations and where resistance to corrosive substances is required.



TESTING PACKAGING in a research laboratory with 5-ton electric traveling hoist, chain sling, and clamps. Second crate is being guided to position on top of first create to simulate impact of actual carloading.

Stainless steel is high in tensile strength, fair in elongation, but low in impact resistance. It is used chiefly for ornamental installations and acid pickling.

Monel has fair tensile and impact strength and elongation. It is resistant to sulfuric and hydrochloric acid solutions but not to nitric.

Bronze has good elongation and fair resistance to impact, but low tensile strength. It is resistant to sulfuric and hydrochloric acid solutions but not to nitric.

Specialized types of chain have been developed for certain industries. Finishes sometimes are added to chains to provide added protection from corrosion or for decorative effect.

Nickel alloy steel hoisting chain is nearly twice as strong as iron chain of the same size. It meets ASTM elongation requirements for iron crane and proof coil chain. It can be used over a wider range of temperature and is relatively immune to failure resulting from fatigue stresses and cold working of the metal.

Impact resistance in heat-treated alloy steel chains does not increase in proportion to the strength of the

#### References—Chain

#### National Safety News

Safer Lifts; S. N. Morrison, Nov. 1950. Chains That Won't Let You Down; Jess Hogans, Jan. 1953.

Hogans, Jan. 1953. Watch Those Chains; July 1953. No Mystery About Chain Failures; N. J.

Gebert, Nov. 1953. Inspecting Chains; H. F. Reid, Jr., May 1954.

How Safe Is That Chain Hoist? E. S. Moorhead, Feb. 1956.

Eye Bolts for Angle Load Safety; M. F. Biancardi, July 1956.



Endless Ropes!
Endless ropes provide natural loop eyes,

Hugs the Load!

Provides safe full-

grip contact



Take a look at the



Macwhyte Atlas Braided Slings are available in a variety of standard types and assemblies . . or in special designs made to fit **your** load-handling requirements. Ask for Circular 5308R.

Kink-Resistant! Braided body resists kinks, snarls, or sets Balanced
Braided Body!
Made of 2 uniformly braided ropes —
one right lay, one
left lay. Each rope
shares the load.

Lightweight! Easier to handle, faster to use.







## MACWHYTE WIRE ROPE

MACWHYTE WIRE ROPE COMPANY, 2906 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of Internally Lubricated PREformed Wire Rope; Braided Wire Rope Slings; Aircraft Cables and Assemblies; Monel Metal, Stainless Steel, Plastic-Coated and Nylon-Coated Wire Rope; and Wire Rope Assemblies. Special catalogs available.

MILL DEPOTS: New York 4, 35 Water St. Pittsburgh 36, P. O. Box 10916, 353 Curry Hollow Road • Detroit 3, 75 Oakman Blvd. • Chicago 6, 228 S. Desplaines St. • St. Paul 14, 2356 Hampden Ave. • New Orleans 2, 144 Thalia St. • Ft. Worth 1, P. O. Box 605 • Portland 9, 1603 N. W. 14th Ave. Seattle 4, 87 Holgate St. • San Francisco 7, 188 King St. • Los Angeles 33, 185 S. Myers St.

chain. Under full working load they will fail under impact before a fully loaded wrought iron or heat-treated carbon chain will fail.

Because of wear and impact factors some manufacturers recommend that link size of sling chains should not be greatly reduced when using high-strength alloy steel chains as compared with wrought iron chain.

#### Use and Care

Storage. When not in use, each chain should be hung on a rack or piled neatly on a dry floor or platform where it will not create a tripping hazard. Exposure to corrosive fumes or liquids should be avoided.

Safe loads. Some plants stamp on a metal tag attached to each chain the safe vertical load which may be lifted with the chain. A better way is to stamp the safe load, or a reference number, on the ring or

Stamp marks should not be placed on links where they might form points of weakness.

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The useful life of all materialhandling equipment, particularly rope and chain, is shortened by overloading, jerking, and neglect of maintenance.

#### Chain Slings

Preferably, slings should be purchased complete from the manufacturer. All attachments should be made to proper dimensions and of material specified for various uses.

Rings and hooks are as important as the chain and should receive the same attention in inspection and maintenance.

When a sling requires repair, it should be sent to the manufacturer.

A hook bent by overloading should be replaced. The stress of bending weakens metal and its strength cannot be restored. \* \* \*

## Hoisting Equipment

THERE are seven common types of hoists. These include the block and tackle, hand chain hoist, electric hoist, air-operated hoist, the portable floor crane, the jib crane, and crabs and winches.

These hoists are mechanical devices suspended overhead and used to raise or lower loads through a vertical plane.

Block and tackle. Blocks threaded with fiber or wire rope are used for raising and lowering scaffolds, hoisting objects, and other industrial purposes.

When used to lift heavy materials or to hold loads suspended, as on heavy-duty scaffolds, wire rope is more serviceable than fiber rope. Wire rope is too stiff for manual handling and requires a winch for operating.

Hand chain hoists may be used where overhead cranes cannot be installed because of lack of head room. They also handle heavy pieces at machines. One hoist may handle the work at several machines.

Chain hoists may be portable, portable but permanently hooked

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A DOUBLE-CHAIN TYPE

ALDON Double-Chain Type has two chocks con-nected with strong chain welded to each block thus preventing travel in either direction. Han-dies available. Weight only 10 lbs. Safe, sure and dependable. Finished in maintenance of way yellow.

- · Easy and quick to
- · No holes to drill.
- . No rail joint interference.
- · No special tools needed.

ALDON Car Stops are portable, and are easily-quickly attached to or removed from rail with only a wrench. Used in pairs, they provide maximum safe, dependable and sturdy service. Adjustable to all rails with maximum leverage clamps. Weight 150 lbs.



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Section 7-Materials Handling

#### -on safe use of Slings and Hoist Lines

#### Professional Weight Lifters Work the Safety Angles



Here's a tip that could save an injury and absenteeism. The weight lifter's secret is proper leverage. Plus use of major leg muscles instead of back muscles. The weight lifter never leans over to pick up the load. He squats down as near as possible to it, and keeps his back erect all the time. Lifting action comes from legs and thighs. If you must use muscle for some of the lighter lifting jobs, these points are worth remembering. But wherever possible-and always for heavy loadsuse hoists and slings.

#### Tuffy Braided Wire Fabric: Successor to Wire Rope in Slings

The unique machine-braided construction of Tuffy Slings provides a com-bination of "free flowing" flexibility and toughness never possible with ordi-nary wire rope. The difference is in the patented 9-part fabric, braided by pre-cision machines in a process that elim-inates inequalities of hand-braiding.



Kinks Are No Hazard with Tuffy Slings One of the first rules of safety: never use a wire rope sling that has been kinked. The wires are permanently bent, damaged or weakened. Not so with Tuffy Slings. Tuffy's patented, 9-part machine braided fabric is just about impossible to kink. And if it does, under some unusual condition, you can straighten out the kink, leaving no material damage. ing no material damage.

#### How to Play It Safe When Loading Slings and Hoist Lines

 Keep pull on sling legs in a straight line. Never shorten legs with knots or I-bolts. If choker and basket hitches are used on slings, check rated load

2. Load slings on the center of hooks. Never at their points, except for hooks specially designed for point loading.

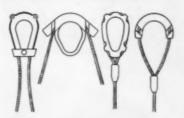
3. Never use load hooks that are bent

open. They have been overloaded, and may drop loads with disastrous results. Same goes for defective chain blocks. Insist that your men report them at

4. Lubricate wire ropes at regular recommended intervals, with lubricant recommended by your local oil company engineer.

#### Proper Fittings Can Give Slings Added Safety and Service Life

The sling eye is usually the point of greatest wear in load handling. The proper sling fitting acts as a shield to proper sling fitting acts as a shield to take the brunt of this wear—the load shocks, abrasion and other stresses concentrated in the eye. Shown here are some of the Tuffy fittings you can have factory-installed in your Tuffy Slings, or they can be installed in your own rigging loft. Left to right: (1) Equalizing Thimble permits ad-justment of the length of sling legs so that loads of varying dimensions may be picked up and handled on an even keel. (2) Newco Sling Bridle will not slip when handling unbalanced loads.
(3) Newco Slip-Thru Thimble allows passage of an identical thimble through



its eye—necessary when a regular sling is used as a choker sling. (4) Newco Slip-On Thimble eliminates flattening or pulling together of eyes under heavy loads; can be attached or removed in seconds.

Tucked Eye Splices-Gripped in Steel for Strength and Safety This Tuffy ferrule, slipped over the tuck-splice of the eye and pressed on under tremendous hydraulic pressure, holds so tight that it gives the eye splice 100% of fabric strength. The ferrule itself is smoothly tapered to meet the main body of the sling. No abrupt edges or rough projections to injure hands and slow down work. The extra life, efficiency and safety of Tuffy's pressed-on ferrule is yours at no extra

#### Tuffy Sling Stamina is Matched in Tuffy Hoist Line

Your Tuffy Distributor Offers the Most in Service and Savings

Tuffy Hoist Line is a special rope construction for use on all types of overhead cranes, derricks and clamshells. Like all Tuffy Special Purpose Ropes, it has the right combination of strength, flexibility and tough-

ness for greatest safety and longest life in its specific range of uses. Tuffy Slings and Hoist Line make a team that cuts hoisting costs and downtime in every type of materials handling.



#### FREE! New Tuffy Sling Handbook

Revised and enlarged edition of this famous aling manual. Covers slings from A to Z. Types, dimensions, weights, rated loads, fittings. Even includes safety-approved standard signals used in operation of various equipment. Send for your free copy now. Union Wire Rope Corporation. Specialists in high carbon wire, wire rope, braided wire fabric and strand. 2272 Manchester Ave., Kansas City 26, Mo.

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#### Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armoo Division . Sheffield Division . The National Supply Company Armco Drainage & Metal Products, Inc. - The Armco International Corporation - Southwest Steel Products

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It contains complete details on all Campbell Sling Chain equipment—together with lots of valuable information on care and use. And you'll find step-by-step instructions for ordering each type of sling chain and attachment—illustrations—specifications and working load limits for all grades.

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Circle Item No. 138—Reader Service Card

onto a monorail trolley, or built into the trolley as an integral part.

Steel is recommended for loadsustaining parts. It withstands sudden shock better than cast iron and is lighter in weight. Chain should be welded, and of quality steel.

Each hoist should be equipped with a braking device which automatically locks the load when hoisting is stopped.

Chains and sheaves should be lubricated at intervals, depending on atmospheric conditions.

Electric hoists range in capacity from ½ to 20 tons, are faster than hand hoists, and less fatiguing for large loads. The light-duty hoist uses link chain for lifting. The heavy-duty hoist uses wire rope.

Electric hoists should be provided with rope or other non-conducting control cords. Each rope should be marked "hoist" or "lower." One method is to use an arrow pointing in the direction in which the load will move when the rope is pulled.

Limit stops prevent the hoist from traveling too far in case the operating handle is not released in time.

Air hoists, operating on compressed air, are used where sparks from electric equipment might be a hazard. The air hoist is limited in travel because of dependence on air lines.

Grabs, grips, and tongs of several types have been developed for use with overhead handling equipment, such as cranes, monorails, and hoists. Some can handle a variety of objects while others are more specialized.

Portable floor cranes or hoists are mounted on wheels and can be moved either by hand or under their own power. These raise and lower loads in a vertical line. They will not rotate around a fixed point.

Portable cranes are useful in plants where overhead belting or shafting prevent use of overhead cranes, and where service is not frequent enough to justify more expensive equipment.

The lifting mechanism may consist of a winch with wire rope and block, or a chain hoist, operated by hand or electric power.

## Tension Stringing with PENGO Equipment

- \* Saves costly manhours in lagging.
- \* Reduces number of set-ups (can string 2 or 3 reels per phase from a single set-up).
- \* Safest, most economical way of stringing transmission, distribution and even secondary lines.
- \* Its greatest savings are effected when stringing over and through energized circuits . . . by far the safest, too!

Smooth, positive control of conductor tension can be maintained at all times regardless of model or size of PENGO tensioning equipment used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

PENGO pulling and tensioning equipment is designed and built by an organization with years of actual line construction experience and a thorough knowledge of stringing problems and requirements. PENGO Tension-Stringing equipment has been thoroughly proven in world-wide use, under the widest range of conditions.

PENGO offers more than 40 models of Tension-Stringing equipment to meet any requirement as to conductor sizes, terrain, and stringing conditions.



795,000 cm ACSR is paid out under controlled ten on this new 33 mile 230 KV H-frame trans-tision line for the Arizona Public Service Co. NGO 6100-54" Real Carrier, which loads roots to 10,000# under power in less than 60 n, handles the conductor room.

O 6700-I-BWCP-TR located approxiwn right of way is pulling in



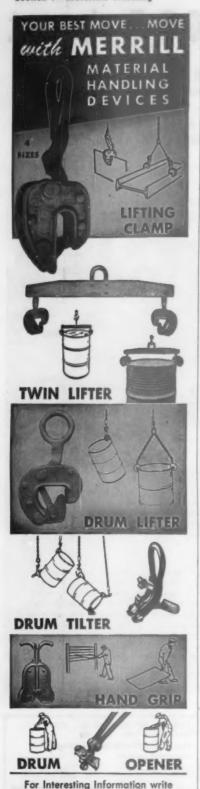
List your requirements and send for descriptive literature and prices.



ENGINEERING CO., INC. Santa Clara, California

PETERSEN ENGINEERING CO., INC. enta Clara, Calif. Dept. H8 Please send PENGO Tension-Stringing quipment data to: ADDRESS

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MERRILL BROTHERS

56-28 Arnold Ave., Maspeth, N. Y.

Electric hoists should be grounded to prevent shock in case of short circuit.

Jib cranes lift, lower, and rotate loads within the circle covered by a rotating arm or jib upon which runs a trolley. The jib is usually supported from a wall or column. A hoist, hand-operated, air, or electric, is suspended from the trolley. A substantial stop at the end of the jib arm prevents the trolley running off. \* \* \*

## Trucks and Tractors

TO KEEP GOODS moving among factories, warehouses, docks and along railroad terminals, materials handling trucks are almost essential. Some of these are hand-operated. Some are power-operated. And all have been designed with specific lifting and/or hauling jobs in mind.

Industrial power trucks are operated by engines using gasoline or liquefied-petroleum gas, or by storage batteries. Many trucks designed for gas have been converted to LPG.

Power trucks should comply with the power truck code specifications for fire protection. These are minimum requirements for trucks in ordinary locations. For hazardous locations requirements are much stricter.

Hazardous locations are defined by the National Electrical Code as:

Class I—Where flammable gases or vapors may be present.

Class II—Combustible dust.

Class III—Easily ignitable fibers or flyings.

The Safety Code for Industrial Power Trucks (ASA B56.1-1950) stipulates that electrical or gaspowered trucks may not be used in these locations unless specifically approved by the inspection authority for the location involved.

Types of trucks covered by the ASA code include high-lift, low-lift, fork, and platform high- and low-lift trucks, tractors, straddle trucks, crane trucks, powered hand trucks, and other special trucks.

Fork lift truck. This is the most widely used power truck. It is a

cantilever type, self-loading truck with vertical uprights and elevating mechanism. Fork trucks permit handling of loads on shallow double-faced pallets as well as skids. Pallets afford a wider load distribution, an advantage in tiering.

Attachments are used for handling a variety of packaged and bulk materials. Clamps permit moving cartons, bales, and drums without pallets.

Dumping attachments are used for discharging liquid, solid, and granular materials.

Canopy guards are required by code for fork trucks where the operator is exposed to danger from falling objects. The guard should be strong enough to support a capacity load and have no opening larger than the smallest package carried.

Scoop trucks shovel loose materials and elevate and dump them into hoppers and bins.

Powered hand truck. The truck, similar to a hand lift truck, is powered by a storage battery and controlled by a walking operator. A motor on the forward wheels supplies power for hauling.

#### References—Trucks, Hoists, Cranes, Conveyors

#### National Safety Council

Powered Hand Trucks; Data Sheet D-317. How High Stacking Affects Fork Truck Stability; Safety Reprint Gen. 27. Crawler, Truck and Similar Cranes; Data Sheet D-448.

#### National Safety News

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Industry's Pack Mules (Hand Trucks); H. W. Overman, Apr. 1955. When It Comes to Conveyors; H. C.

Keller, July 1955.
Your Fork Lift Trucks and the Men Who
Drive Them; W. L. Sheffield, Sept. 1955.

Outfitting Cranes for the Automatic Factory; W. C. Bennett, Dec. 1955. How Safe Is That Chain Hoist? E. S. Moorhead, Feb. 1956.

Moorhead, Feb. 1956.

How About Hoists? B. J. Povolny, Jan.

Guarding Overhead Lifting Devices; A. J. Ruzich, July 1957.

#### American Standards Assn.

Conveyors, Cableways and Related Equipment, Safety Code for, B20.1-1947. (See also manuals published by manufac-

turers of equipment and their trade associations.)



### **Bethlehem Slings for Every Kind of Lift**

Whether you're moving a load like this big forging, or something that weighs just a few hundred pounds, you can make the job easier with Bethlehem slings. For there's always the right Bethlehem sling for every type of lift. No need to "make do" with something that really isn't suitable.

The lift shown here is being made by means of a Bethlehem combination. Two kinds of slings are in use. Those suspended from the overhead crane are a double-part, twoleg type with open sockets and hooks. The others are single-part slings with spliced loop ends. They add up to an efficient style of rigging for this sort of load. Your own lifting problems may be altogether different. But you'll always find a Bethlehem sling, or combination of slings, that will meet your needs. The Bethlehem line includes grommets, braided and single-part models, and all types of bridles. And whenever you require something special, something out of the ordinary, Bethlehem technicians will design it for you in very short order.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM STEEL



Circle Item No. 142—Reader Service Card



Provides constant grounding of moving conductors as they are pulled on a stringing job.

The EVER-GROUND gives protection to linemen against accidental energizing of conductors, which could result in fatal injuries or severe burns.

EVER-GROUND snaps on the line at any point without a threading-through operation. High-contact rollers have Oilite Bearings—no oiling necessary. The large coil spring keeps the rollers in firm contact pressure with the moving conductor at all times, and permits the passage of splices.

Secure EVER-GROUND to cross-arm or reel with rope line. It will "float" on the moving conductor, keeping it constantly grounded.

Catalog #JT3, shown above, will take conductors from 1/16" to 11/2" diameter. Models available for all size conductors.

#### PAUL S. EVERLEY CO.

550 Ninth Street, San Francisco 3, Calif.

HEmlock 1-2295



A powered hand truck should have a dead-man control so brakes will be applied instantly when the operator releases the handle.

Platform truck. Used for hauling baggage, mail, and packages at railroad stations and steamship piers and in industry for some jobs where loads cannot be palletized. Loading is by hand.

Low-lift platform truck. Platform elevates just enough for horizontal movement. It picks up loaded skids, moves them and sets them down without manual handling or use of other equipment.

High-lift truck. This may be a fork, platform or special type. It has a lifting mechanism to permit tiering one load on another.

Ram trucks. This type has vertical uprights and elevating mechanism like a fork truck. It is normally equipped with a single ram for picking up coils or rolls.

Roll-handling trucks for handling paper are equipped with a cable drum and two cables. Hooks on the cables hook over the ends of a rod which serves as an axle for the roll.

Crane trucks are equipped with boom, cable, and drum. Hooks, spreaders, and slings are used for moving heavy unit loads and objects too large to be handled on truck platforms or forks.

Tractors and trailers are used where large quantities of materials are moved relatively long distances, as at freight terminals and piers. Loading and unloading is done manually or by crane or other equipment.

#### **Hand Trucks**

The two-wheeled hand truck, designed for handling bags, drums, barrels, cartons, and beverage cases, comes in a variety of sizes and types. It can be equipped with brakes.

Hand platform trucks, available in several designs with capacities for 150 to 2,000 lb., are suitable for short hauls. They usually are designed to be pushed by one of the end racks.

Hand lift trucks. The load, supported on platforms or skids, is

raised enough for horizontal movement and pulled by hand power. These are useful where loads are relatively light and distances short.

Wheelbarrows are useful for hauling and dumping bulk materials. They can be used where a 2- or 4-wheeled vehicle could not be maneuvered. Bodies of aluminum and magnesium alloys, and rubber tires, have made them lighter and easier to handle. \* \* \*

#### **Bridge Plates**

Movable plates for bridging the gap between loading platforms and carriers are needed for both hand and power trucks. Bridge plates are usually of steel or lightweight magnesium or aluminum alloys.

Sides of bridge plates should be turned up at right angles to prevent trucks running over the edge. Handholds facilitate handling.

Bridge plates should have a high friction surface to prevent slipping of vehicles or persons. Plates should be designed so when they are in position the ends will have substantial contact with the loading platform and the carrier to prevent rocking or sliding when in use. \* \* \*

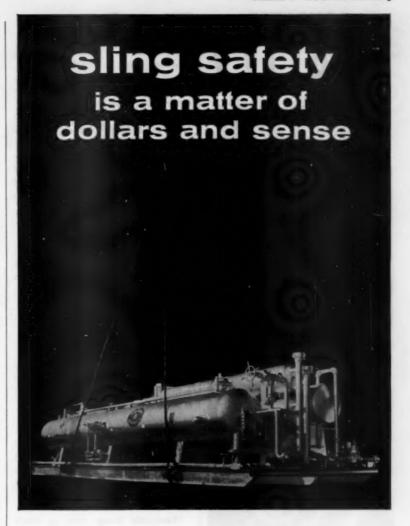
#### Exhaust Purifiers for Power Trucks

Where trucks powered by internal combustion engines are operated in confined spaces, carbon monoxide is a problem. Use of catalytic exhaust on trucks permits operation indoors where there is good ventilation. Types of exhaust purifiers are available for white (unleaded) gasoline, liquefied petroleum gas, leaded gas, and diesel fuel.

Preventive maintenance of trucks keeps down carbon monoxide in the exhaust. This includes a frequent check of the carburetor, since too rich a mixture can produce excessive quantities of the gas.

#### **Crossover Bridges**

Where loading docks are separated by railroad tracks, crossover bridges are needed. Some are of the drawbridge type. Others are mounted on four pillars that can be raised or lowered quickly by push-button control.



When you're lifting heavy, expensive equipment, remember that the difference in cost between a <u>safe</u> sling and one of inferior quality is small in comparison to the costs resulting from sling failure.

Wickwire Slings have earned the confidence of safety-minded operators. For every Wickwire Sling is subjected to rigid tests at every stage of production. A safety factor of 5 is used in the design of Wickwire Slings.

A new illustrated folder, showing the full line of Wickwire Slings, end attachments, assemblies and fittings is available from your Wickwire Rope Distributor or from our nearest sales office. Call or write for your copy today.

Certified Slings, proof-tested to loads equal to twice their rated capacity, are available at slightly higher cost.

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#### WICKWIRE WIRE ROPE SLINGS

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque \* Amorillo \* Billings \* Boise \* Butte \* Denver El Paso \* Farmington (N.M.) \* Fort Worth \* Houston \* Kansas City \* Liscoln (Neb.) \* Odessa (Tex.) \* Oklohoma City Phoenix \* Pesblo \* Soil Loke City \* Tisa \* Wicking \* PACIFIC COAST DIVISION—Los Angles \* Oukland \* Portland San Francisca \* San Leandro \* Seattle \* Spokane \* WICKWIRE SPENCER STEEL DIVISION—Boston \* Buffala Chattanooga \* Chicago \* Detroit \* Emilenton (Pa.) \* New Orleans \* New York \* Philadelphia Circle Item No. 144—Reader Service Card

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another advantage of alloy sling chains! OF TEST



Circle Item No. 145-Reader Service Card

## Fiber Rope

FLEXIBILITY, ease of tying, splicing and manual handling. These qualities of rope made from natural fibers have enabled workers to hoist and haul for centuries.

While this kind of rope has been made from many types of fibers, the best ropes have good tensile strength and resistance to weather and abrasion. These properties are necessary in techniques using block and tackle, slings, suspended scaffolds, and in marine operations.

#### **Natural Fibers**

Manila is standard for tensile strength and durability. New, clean manila of good grade is hard but pliant. It is yellowish with a smooth, almost silky feel.

Sisal is the next best fiber. Strength varies from 65 to 80 per cent of manila. It is yellowish, sometimes slightly green, and lacks the gloss and smoothness of good manila. Sisal fibers are stiff and have a tendency to splinter.

Mexican sisal (henequin) lacks the strength of high-quality sisal but has been used to some extent during shortages of better grades of rope. Strength is about 60 per cent of manila.

American hemp fiber is much softer than manila. It is dark gray. It is not highly resistant to abrasion, but when tarred will give fair service on some jobs. Strength is about 80 per cent of manila.

Jute and cotton are not recommended for handling material or other uses where strength and durability are needed. Strength is about 50 per cent of manila.

#### **Synthetic Fibers**

Several types of synthetic fibers have been introduced in recent years. Higher cost and inherent characteristics of some materials have limited their use.

Nylon has high tensile strength, toughness, flexibility, and durability and is easy to handle.

Nylon rope has a higher tensile strength, wet or dry, than natural

fibers and does not show marked deterioration when frozen. Melting at 480 F, it can be readily destroyed by fire but does not ignite. It is resistant to rot, mildew, and alkalis, but is damaged by acids and drying

Glass fiber has high strength when dry, but low resistance to flexing and abrasion.

Saran resists rot and many chemicals and is practically unaffected by aging, direct sunlight, and moisture. It has only moderate resistance to abrasion and temperature.

#### Care of Rope

Fiber rope should never be exposed to high temperatures, acid splashes, or fumes. Sharp bends should be avoided. Where a sling passes over sharp edges, pads should be used to protect the rope.

Rope should not be kept in stock for long periods. Even with careful handling and favorable storage conditions, vegetable fibers deteriorate

-To page 210



... The Easiest One-Man **Drum Moving Ever!** 

MORSE Model 55-0 DRUM CRADLE

TRUCK Low-cost and versatile, this cradle truck carries . . . rotates, manually . . . dispenses. Has side opening for drums with side drain cocks.

Long wheelbase and retractible caster frame gives exceptional stability under load. For 55 and 110 gal. drums. Circle this product for literature and prices,

#### MORSE Model 150-R DRUM HAND TRUCK

One man can pick up a 1,000 lb. load . . . and balance it with one finger. Model 150-R features rubber tired wheels with ball bearings for quiet, easy rolling. Permits preeasy rolling. Permits pre-cise positioning of loaded drums. For drums 24" to 45" high and with diameters from 15". Sturdy steel con-struction. Circle this product for litera-ture and prices. ture and prices.

Clip this ad to your letterhead



MORSE MORSE MANUFACTURING CO., INC. 765 West Manifes Street, East Syracuse, M. Y

Circle Item No. 146-Reader Service Card National Safety News, March, 1959

# MACHINE OPERATION AND GUARDING

#### IN SECTION 8:

9999999

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Lubrication for High Speed 204

MOST MACHINES and processes can be guarded more or less effectively. But if the guard interferes with production or the cost is out of proportion to the hazard, it is not likely to be popular with operators or management.

Modern machines have a high degree of safety built into them. Enclosed moving parts, push-button controls and automatic pressure lubrication make for safer operation. Electronic and radioactive devices, still limited in their applications, offer interesting possibilities.

Automation, with increasing use of automatic processes and remote control, will undoubtedly remove many familiar hazards and probably introduce some new ones.

Mechanical safeguarding involves far more than keeping moving parts under cover. It includes electric power and its controls, and the hand and portable power tools that keep the machines running.

## **Guarding the Machine**

TODAY'S MACHINES, with moving parts enclosed, present a trim, streamlined appearance with a high degree of built-in safety. Overhead belts and shafting have been replaced by individual motor drives. Pressure lubrication reaches remote bearings without exposing the oiler to hazard or shutting down the machine.

The point of operation, however, hasn't been entirely tamed. Few operations now require the operator's hands in the danger zone but they do get there at times and machinery still ranks high among the causes of serious injuries. The individual must be protected against his own lapses as well as against mechanical hazards.

Color is an important safeguard. Highlighting the point of operation with light tints in contrast to the darker background of the machine reduces the effort of seeing. Guards painted in high-visibility colors are also conspicuous when missing.

Standard guards for many types of machines are on the market. These are often installed on older machines, on newer ones where built-in guards have not been provided, or where specially made guards are needed. For power presses, circular saws, and other machines, many types of guards are available.

A guard should not restrict production seriously. If it does, it will not be popular with either operator or management.

Some operations can be guarded effectively with commercial guards. Others require custom-built guards developed through study of the job by both operating and safety departments.

Machines involved frequently in accidents include woodworking machines such as circular saws, jointers and planers, and power presses.

Guard design must often be approved by state factory inspectors and insurance engineers. Since state codes are not uniform and at best represent only minimum requirements, recommendations of the American Standards Association or

the inspection department having jurisdiction are the best guides.

#### **Point of Operation**

Guarding the point of operation effectively is much more more difficult than enclosing power-transmission apparatus.

Point-of-operation guards are installed at those parts of machines where cutting, shaping, or forming is performed, and at other points potentially hazardous to operators inserting or manipulating stock.

Guards should protect operators both from moving machine parts and from moving materials. Safeguards are of these types:

- 1. Automatic feeding and ejecting.
- 2. Two-hand control.
- Redesign of machine parts so the operator cannot get into the danger zone.
- Devices that stop machines by electronic devices while any part of the body is in the danger
- 5. Devices that pull or push hands away from the danger zone.
- 6. Barricades, covers, hood guards, and other enclosures.
- 7. Quick-acting brakes operated by contact of the body.
- 8. Interlocking devices.

Hood enclosures and cover guards are used on woodworking machines and other types of equipment. Frequently, such guards are automatic. Others are of rigid construction.

Nip hazards, such as rubber mills, calender rolls, dough brakes, and others, can be protected by sensitively adjusted controls that operate dynamic brakes when contacted by any part of the operator's body. These guards stop the machine quickly.

Two-hand controls frequently are installed on power presses, bakery machinery, guillotine paper cutters, and other types of equipment where barrier guards are not practicable.

Interlocking devices prevent operation of the starting control when the cover or barricade is not in place. These are used on centrifugal extractors, dough mixers, tumblers, and some types of pressure vessels.

#### **Power Presses**

Safeguarding power-press operations is one of industry's major accident-prevention problems. Because of the many types of presses and specialized operations performed, the subject is highly complicated. Material on press operation is available from the National Safety Council, American Standards Association, U. S. Department of Labor, insurance companies, and consulting engineers.



FREQUENT INSPECTION, plus regular follow-ups, keep equipment in safe operating condition. (Hanford Atomic Products Operation, General Electric.)

Automatic feed makes it unnecessary (but not impossible) for an operator to place his hand between punch and die. It is still necessary to provide a gate guard, enclose the ram, or limit its stroke to 1/4 in. or less.

For some operations, semiautomatic feeds are used. Principal types are: chute, plunger, slide or push, sliding dies, dial, and revolving dies.

Two commercial guards adaptable to many operations are the sweep and pull-back types.

Sweep guards are best used on small presses. They are easily adjusted and give the same protection when the clutch fails as they do for a regular stroke of the press.

A flag of fiber or other material placed on the sweep arm helps to prevent an operator reaching around the guard on one side, and on slowmoving presses, from putting his hand between punch and die after the guard has swept past the center of the stroke.

Sweep guards are not effective on large presses.

Pull-back guards forcibly remove the operator's hands from the point

#### References-Machine Guards

#### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

Inspection and Maintenance of Power Presses; Data Sheet D-224.

Individual Die Guards and Adjustable Press Barriers; Data Sheet D-365.

(See complete list of Data Sheets for information on guarding various types of machines.)

#### National Safety News

Taming the Saw; L. H. Reineke, July

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Mechanical Power Transmission Apparatus, Safety Code for; B15-1953.

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ment, Safety Code for; B19-1938.
Power Presses and Foot and Hand Presses,
Safety Code for; B11.1-1948.
Woodworking Machinery, Safety Code

for: O1.1-1954.

#### MATERIALS FOR GUARD CONSTRUCTION

Clearance from moving part at all points	Largest mesh opening allowable	Minimum gauge (U. S. Standard)		
Under 4 in. 4-15 in.	½ in. 2 in.	No. 16 No. 12		
Under 4 in. 4-15 in.	½ in. 2 in.	No. 18 No. 13		
Under 4 in. 4-15 in.	½ in. 2 in.	No. 20 No. 14		
Under 4 in. 4-15 in.	*****	No. 22 No. 22		
Under 4 in. 4-15 in.	½ in. 2 in.	Wood 34 in., metal No. 16 Wood 34 in., metal No. 16		
Under 4 in. Under 4 in.	½-in. width	Wood ¼ in., metal No. 16 Wood ¼ in., metal No. 16		
	Under 4 in. 4-15 in. Under 4 in. Under 4 in. Under 4 in. Under 4 in.	The image is a second or content of the image is a second or content or con		

of operation if he is out of rhythm with the machine. Cables connect the ram with wristlets on the operator's arms. As the ram descends, the hands are forcibly withdrawn.

The guard must be adjusted to each operator and each job because of variations in arms, hands, and fingers.

Die design. On punch and forming presses it is frequently necessary to install guards of a different type for each set of dies used. For this reason, enclosure guards should always be considered integral parts of the dies.

Feeding tools. Several types of feeding tools are used on presses with automatic feeds or enclosed guards. These tools are made of soft metal, aluminum, or magnesium. They include pushers, pickers, pliers, tweezers, forks, and suction disks.

These tools are not substitutes for guards. They should be used only with two-hand trips or pull-back guards.

Electronic guards. The photoelectric relay consists of a beam of light. When this is broken by the operator's hands, the start or completion of the ram stroke is prevented. The relay responds instantaneously, is automatic, takes up little space, is easily installed and economical to

maintain. Its disadvantages are comparatively high installation cost and limited uses.

On presses with friction clutches, the ram travel stops immediately when the light beam is broken. This method is not effective on presses with positive clutches because the ram will continue its stroke until the end of its cycle. The guard should be operated from a closed electric circuit so that current interruption will automatically prevent the press from tripping.

Radioactive guards have been used on some power-press operations. The operator wears radioactive wrist bands. When his hands are in the protected area, the radioactive units are detected by Geiger tubes, and the press will not operate. Radioactive materials are within safe limits.

#### **Power Transmission**

Power transmission apparatus includes shafting, belting, pulleys, gears, starting and stopping devices, and other moving parts of equipment used in the mechanical transmission of power. Also included are prime movers, intermediate equipment, and other machines.

Power transmission parts, particularly in modern installations, contribute relatively few injuries.

-To page 205

## **Electrical Equipment**

Keeping current at work under cover

ELECTRICITY has been serving man for less than a century yet it now dominates our whole way of life. Light, industrial operation, transportation, and communication now depend on uninterrupted electric power. It has made factories cleaner, safer, and vastly more efficient.

The world's demand for power will continue to grow. Looking forward to the time when fossil fuels will be inadequate, the atomic power plant is entering the picture.

Electricity serves us with a high degree of safety. It can be controlled by modern utilization and protective equipment but safety requires constant vigilance and careful maintenance of all apparatus.

Rules for use of electrical equipment are found in the National Electrical Safety Code, which deals with accident prevention, and in the National Electrical Code which is concerned with fire protection.

Electrical equipment bearing the approval label of a recognized testing laboratory can be purchased with confidence. It has passed brutal tests and labeled products are reexamined periodically.

Installation. All electrical work should comply with applicable codes.

Transformers, control boards, starting rheostats and other apparatus should be placed where there is the least danger of accidental contact with energized conductors. All exposed current-carrying parts should be further protected by enclosures, railings, or special guards.

Motors should be mounted so they won't interfere with plant traffic. Non-enclosed-type motors should be located in areas relatively free from dust, moisture, or corrosive vapors.

Isolating equipment, Transformers, control boards, and other accessories should be placed in special rooms to which only authorized persons have access.

If a separate room is not feasible, enclosures should be built around equipment having exposed conductors. Metal enclosures should be effectively grounded.

Barriers may be used to prevent accidental contact with electrical equipment. Frames may be made of wood, rolled metal shapes, angle iron, or pipe. Filler may be of woodstrips, sheet metal, perforated metal, expanded metal, wire mesh, or shatterproof transparent material.

Some protection can be obtained by elevating wires and currentcarrying parts at least 8 ft. above any working level to which employees (other than qualified electricians) have access.

Where long metal parts, such as rods, bars, and pipes are handled, partial enclosures or barriers should be provided to prevent contact with overhead electrical installations.

Warning signs should be displayed near exposed current-carrying parts, especially high-voltage installations.

Many standard machine-guarding practices apply to electrical equipment, but there are certain hazards peculiar to electricity. Particular attention should be given to the National Electrical Safety Code and the National Electrical Code.

Protective grounding is necessary for exposed non-current-carrying metal parts if the equipment is supplied by means of metal-clad wiring, when installed in a wet location, and when it operates with any terminal at more than 150 volts to ground.

Parts to be grounded include motor frames, cranes, cases of transformers and oil switches, wiring conduit, and metal lamp sockets.

Frames of all portable motors which operate at more than 50 volts to ground should be grounded.

Motors should be of the type and size required for the load and for conditions under which they must operate. Overloading for long periods, use of non-approved motors in areas containing flammable vapors or dusts, and defective wiring should be avoided.

Motor windings should be protected from metal particles, dirt, dust, lint, or other material which may damage the windings or become ignited.

In areas containing flammable dust and gases, motors designed for hazardous locations should be installed. The *National Electrical Code* should be followed.

Grounded metal enclosures are recommended for starting rheostats, switches, fuse panels, and other operating accessories.



CURRENT is kept under cover in modern installations, as in this main distribution panel with safeguards for switching in a laboratory.



## SCHRADER SQUARE-END CYLINDERS

meet and exceed JIC specs . . . 250 psi air . . . 750 psi hydraulic!

Here's compact, versatile straight-line power. Just look at the features!

Use Schrader's new square-end double-acting cylinders for holding, positioning, moving work—for push, pull or lifting—for automating manual operations. In five sizes up to 4-inch bore, and with five interchangeable mountings, these "square-ends" are economical and versatile. Bolt, leg, flush, side flush or base...each JIC Cylinder will mount all five ways. Suitable for air

pressures to 250 psi, or hydraulically to 750 psi-available cushioned or non-cushioned.

You get safe, controlled, low-cost power with Schrader "square-ends"—another addition to the line of famous Schrader quality Air Control Products.

Complete stocks available locally—expert help to improve your air control hookups. Write for your complete specifications and data on these new "square-ords"

Bolt Mounting Leg Mounting Flush Mounting Side-Flush Mounting Base Mounting



A. SCHRADER'S SON
Division of Scovill Manufacturing Co.
452 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

In some devices, both switch and fuses are enclosed in a cabinet arranged so the switch can be operated without opening the cabinet. The switch is interlocked through a cam so fuses are inaccessible until the switch is opened.

Another type of enclosed switch permits the door of the cabinet to be opened with a key, even though the switch is closed. With either type cabinet, it is possible to padlock the door open or closed, and the switch can be padlocked in the open position.

Maintenance precautions. When repair work is being done on motors, controlling devices, or the machinery they drive, the circuit should be de-energized by opening necessary switches and locking them in the open position.

If a switch cannot be locked open, it should be blocked and a tag attached showing the switch is to be closed only by the man whose name appears on the tag. Warning signs should be displayed.

#### References—Electricity

#### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

Scientific Facts Concerning Electrical Hazards; Safety Reprint Gen. 4.

ABC's of Electricity and Its Hazards;

Safety Reprint Gen. 59.

Grounding Portable Electric Equipment; Data Sheet D-299. Locking Out Electric Switches; Data Sheet

D-237. High Voltage Testing of Insulated Wires

and Cables; Data Sheet D-388. Cleaning Electric Motors and Machinery; Data Sheet D-285.

Electric Cords and Fittings; Data Sheet

#### National Safety News

Electricity and the Human Body; W. B. Kowenhoven, Feb. 1951.

Low Voltage, High Hazard; Herbert Heinrich, Oct. 1953.

Volts and Jolts; C. P. Shirey, July 1954. Safe Fixtures for Explosive Atmospheres;

Grounding Equipment in Industry; R. J.

Beeswy, Feb. 1956 (ASSE Journal).
The Shock That Kills; N. Gillmor Long, M.D., June 1958.

Electronics at Your Service; Marshall E. Kulberg, Jan. 1959.

#### American Standards Assn.

National Electrical Code; C1-1951 (NBFU Pamphlet No. 70).

National Electrical Safety Code; C2-1947 (NBS Handbook H30).

#### Underwriters' Laboratories

Electrical Appliance and Utilization Equipment List.

Hazardous Location Equipment List.



FLEXIBLE electrical conduit for use in locations. Synthetic covering over flexible metal core protects wiring against moisture, oil, dirt, chemicals, and corrosive fumes.

Wiring depends on type of building construction, size and distribution of electrical load, exposure to dampness or corrosive vapors, location of equipment, and other factors. For most plant conditions, rigid metal conduit, effectively grounded, is preferred.

Other types of wiring which may be used under certain circumstances include armored cable, non-metallic sheathed cable, flexible metal conduit (BX), and raceways. National and local wiring codes should be followed.

Aluminum wire. The currentcarrying capacity of aluminum wire is 84 per cent of that of copper wire as specified in the 1953 and earlier editions of the National Electrical Code. For circuits it has been common practice to use an aluminum conductor two American wiregauge sizes larger than a copper conductor to comply with the 84 per cent factor given in the code.

#### Cords, Sockets, Lamps

Extension cords should be of a type listed by Underwriters' Laboratories and labeled to show compliance with the National Electrical Code. They should be inspected regularly. Kinking or excessive bending of cords should be avoided.

Ordinary lamp cord should not be used where it will be exposed to mechanical wear or to moisturenever for extension lamps in boilers,

tanks, or on damp or metal floors.

Cord for portable tools and equipment is made in several grades. Rubber-sheathed cord should be used with tools and lamps in boilers, tanks, and other grounded enclosures.

For heating devices, such as electric irons and water heaters, cord requires an insulating covering containing flameproofing material such as asbestos fiber. It resists high temperature and moderate dampness.

Sockets should be of porcelain, non-conducting plastic, or rubber covered. Ungrounded metal-shell sockets are not recommended.

Extension lamps are sometimes used where a shock of 110 volts might be fatal. Safe cords and lamp holders must be provided and maintained in good condition. Handles should be of non-conducting material and there should be no metallic connection between lamp guard and socket shell.

Because metal frames of portable electrical equipment should be grounded, cord with a green covered ground conductor should be used with a polarized plug and receptacle. If plant circuits do not have polarized receptacles, a third wire taped at intervals to the cord may be used. One end of the third wire is connected to the frame of the tool; the other end, which should be several feet longer than the cord, is clamped to a water pipe or other effective ground with a spring clip.

Miniature voltage. Portable transformers which step the lamp voltage down to 6 volts are frequently used where shock hazard is serious.

Employee training. The safety program should include thorough training of employees who install or operate electrical equipment. In addition to instruction in the hazards of electricity they should be trained in first aid.

Of particular importance is knowledge of the arm-lift, back-pressure method of resuscitation. Distribution employees should also know the pole-top method.

#### **Over-Current Devices**

Fuses or circuit breakers should be installed in every circuit for pro--To page 208

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WITH BAILLY
EQUIPMENT

- For Controlling Gas Mains... Bailey Goggle Valves in thermal expansion (36" to 120" diameters) and mechanical (6" to 72" diameters) types.
- For Plugging Tapping Holes . . . Bailey Clay
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- For Blast Furnace Stoves . . . Bailey services include design, construction and relining using Kennedy Checkers with cross-flue feature.
- For Cooling Blast Furnace Linings...Bailey
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  seal, with ease of removal for inspection or replacement.
- For Pig Casting . . . Bailey Pig Casting Machines provide trouble-free service while increasing casting capacity for foundries and blast furnaces.
- For Stopping Cinder Notches... Bailey Cinder Notch Stoppers eliminate hazards to workmen at the cinder notch.
- For Sintering . . . Bailey Pug Mills assure efficient pugging or mixing for blast furnace dust catchers and sintering plants. Feeder illustrated for Dust Catcher Mill maintains an even flow of the material to be processed.
  - Other Bailey Products: Blast Furnace Cold Blast Valve Blast Furnace.
    Blow-Off Valve Check and Snort Valve Mixing and Check
    Relief Valve Fabricated Steel Stove Bottom Precision
    Table Feeder Ladle Skulling Hook



Circle Item No. 148-Reader Service Card

## **Tools—Hand and Power**

HAND TOOLS, the craftsman's companions since the beginning of civilization, are still needed to put the finishing touches on many machine-made products and in construction and maintenance work.

Estimates are that hand tools are involved in from 5 to 15 per cent of disabling occupational injuries and a large but unknown number of minor wounds. Most of these are caused by accidental contact with cutting edges or by severe blows.

Portable power tools speed up many jobs in industry and at home and have the added hazards of high speed. With electric tools there is also the risk of shock.

#### **Types of Tools**

Tools commonly used in industry are of 5 general types:

- 1. Metal cutting. Cold chisels, marking tools, hacksaws, bull chisels, files, tin snips, and cutters.
- 2. Wood cutting. Chisels, gouges, saws, axes, adzes, hatchets, knives, brad awls, planes, scrapers, bits, and drawknives.
- 3. Lifting. Levers, crowbars, jacks, hooks, and shovels.
- 4. Torsion. Wrenches, pipe tongs, screwdrivers, and pliers.
- 5. Striking. Hammers, sledges, mauls, picks, and punches.

Accident causes, One or more of four causes are primarily responsible for injuries. Following are examples:

 A wrong or improvised tool a file or screwdriver for prying; a wrench for hammering.

 A defective tool — a mushroomed chisel head; a dull saw or knife; a split maul handle; a tool of poor quality.

3. Tools incorrectly used—striking two hard-surface tools together; failing to take practice swing with sledge to adjust for clearance; pulling on pliers in line with face.

 Tools not put away—wood chisel loosely laid in tool box; hammer left on edge of machine; knife left on table. Selection. Tools for both routine and special work should be kept in stock or readily available. Highgrade tools are the best buy and the difference in initial cost is offset by longer life, reduced upkeep, and lessened risk of accident.

Suitable arrangements should be made and responsibility placed for the purchase, handling, and care of tools. The purchasing department should be kept informed of tool performance as a guide to future purchases.

Alloy steels combine strength and toughness with light weight which justifies the higher cost for some jobs. Alloys are used for hammers, wrenches, screwdrivers, woodworking tools, pliers, rivet sets, saws, knives, and punches.

Some alloys resist mushrooming and chipping but no tool should be subjected to unnecessarily rough use.

Non-ferrous hammers or mallets should be used for striking tempered or case-hardened tools. These hammers are usually made of copper, lead, bronze, brass, rawhide, or wood.

Handles. With hammers, sledges, axes, and picks, the greatest strain is where wood and metal join. An adequate supply of good handles

should be kept in the toolroom. These should be straight-grained wood, free from slivers. Hickory, ash, and maple are preferred. Handles should be fitted by an experienced person.

Insulated tools. For working near electrical equipment, tools with insulated handles are frequently used. These provide desirable protection but are not a substitute for rubber gloves and other protective devices.

Marking tools. Steel stamps and holders for stamping indentification marks on machine parts and other metal surfaces are available in alloys which resist mushrooming and do not chip readily.

Car movers. For moving cars on rails, car movers which do not slip readily are available. When two men are needed to move a car, two car movers should be used. Ordinary crowbars should not be used.

#### The Tool Room

Centralized tool control facilitates uniform inspection and maintenance of tools. Protective equipment, such as goggles, should be recommended and issued with the tools.

Centralized control also makes it possible to keep records on tool failure and locate unsafe conditions and unsafe acts. Tools are exposed to less damage than with scattered storage.



A TOOL BOARD is an aid to housekeeping and tool maintenance. Missing tools and those in bad condition are easily spotted.

#### PORTABLE ELECTRIC TOOLS



- Use only equipment that is in good condition. Take good care of it.
- 2. Be sure the tool is properly grounded.
- 3. Report the following unsafe conditions:

  Defective or broken insulation on cord.

  Improper or poorly made connections to terminals.

  Broken or otherwise defective plug.

  Loose or broken switch.

  Brushes sparking.
- Do not overstrain the tool, thus overloading the motor.
- Never use a portable electric tool in the presence of flammable vapors or gases, unless it is designed for such use.

NSC Safety Instruction Card No. 91

A procedure can be set up so the attendant can send tools in need of repair to a department equipped for reconditioning.

A set of numbered checks can be issued to each employee at the time of employment. These are exchanged for tools at the supply room, By this system the attendant knows where each tool is and can call it in for inspection at regular intervals.

When there are operations at several locations it is not always practicable to maintain a tool supply room. In such cases the fore-

## References—Portable Hand and Power Tools

#### National Safety Council

Accident Prevention Manual for Industrial Operations, 1955.

Grounding Portable Electric Equipment; Data Sheet D-299.

Electric Hand Saws; Data Sheet D-344. Electric Cords and Fittings; Data Sheet D-385.

Explosive Splitting Wedges or Guns; Data Sheet D-321.

#### National Safety News

Flexible Shaft Tools; Data Sheet D-386. Blow Torches and Plumbers' Furnaces; Data Sheet D-470.

Maintaining Electric Hand Tools; Feb. 1950.

Check It to Check Your Accidents; George MacDonald, Feb. 1953.

Why Electric Tools Are Safe; E. L. Connell, Apr. 1954. man should inspect tools frequently and take out of service those found defective. A check list is helpful.

Some workmen provide their own tools. These should receive the same inspection as those owned by the company.

#### **Carrying Tools**

Tools should never be carried when both hands are needed for climbing. A strong bag, bucket, or other container should be used for hoisting or lowering tools.

Chisels, screwdrivers, and pointed tools should never be carried edge or point up in the pocket. They should be carried in a tool box or cart, in a carrying belt like those used by electricians and structural steel workers, in a pocket tool pouch or in the hand with points and cutting edges away from the body.

Display boards used for maintenance and repair tools encourage return of equipment.

## THE STORY of the BROKEN GRINDING WHEEL

A whirling grinding wheel can tell its own story of havoc when it explodes... But in this case Perks Safety Washers do the telling!

A test conducted in the Sta-Safe laboratory used the new neoprene faced Perks Safety Washers and an 8" grinding wheel cracked in two places. At 5,000 RPM —an outer surface speed of 12,500 feet per minute— Perks Safety Washers held the wheel intact!



Standard Safety does **not** recommend to you the use of broken grinding wheels—even with Perks—but Standard Safety does recommend Perks Safety Washers as a precaution against possible tragedy in your company. Perks Safety Washers are easily installed on any size grinding wheels. Keep your equipment and personnel safe-guarded. Write now for Bulletin No. 54 containing complete information about Perks Safety Washers.

#### STANDARD SAFETY EQUIPMENT CO.

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604 BROADWAY NEWARK 4, N.J. 12921 W. WASHINGTON BLVD. LOS ANGELES 46, CALIF. 855 EAST 152nd STREET CLEVELAND 10, OHIO Racks or bins which can be moved to the work area are also useful.

Each workman's tools should be kept in a box or rack convenient to his work area. The box should have designated places for wire brushes, chisels, saws, and knives to avoid sharp edges being exposed.

Inspection. Permissible wear limits for tools should be set up as a guide for inspection when they are returned to the crib. Lacking such standards, the attendant or inspector should be qualified to pass on the condition of the tool.

Periodic inspections of tool operations are needed to insure efficient control. Inspections should include housekeeping in the tool crib, tool service, number of tools in the inventory, handling procedure, and condition of tools.

Maintenance and repair require adequate facilities, such as work benches, vises, forge or furnace for hardening and tempering, tempering baths, repair tools, grinders, goggles, and adequate lighting. Repairs should be done by trained men.

#### **Non-Sparking Tools**

Tools of non-ferrous materials are often used where flammable gases, highly volatile liquids, and other explosive substances are used or stored. These tools are made of such metals as aluminum, bronze, brass, and beryllium-copper.

Tools made of these alloys include hammers, chisels, punches, prybars, screwdrivers, scrapers, spatulas, picks, and shovels. Special tools of any type can be made to order

Substances easily ignited include gunpowder, lint, TNT, carbon disulfide, and ethyl ether.

Being softer than steel, non-ferrous tools are less likely to break off fragments from the metal being worked on by the tool.

With continued use, these tools may become impregnated with particles of foreign substances which may cause sparks if not removed. Frequent inspection is needed.

Non-ferrous alloys are more expensive than steel. These special tools are used only where there is an explosion hazard.

#### **Portable Electric Tools**

General classifications of handoperated, power-driven tools are:

- Abrasive tools, such as disk and portable belt sanders, polishers, and bench and flexible shaft grinders.
- 2. Drills.
- Saws and other cut-off tools and routers.
- Assembly tools, such as screwdrivers, nut runners, and tappers.
- 5. Hammers.
- 6. Sheet-metal shears.
- 7. Fans.

Portable electric tools are generally designated as:

Light duty, for intermittent use on light work.

Special duty, or standard duty, for slightly heavy work or fairly continuous operation.

Heavy duty, for continuous operation and production service or for heavy work.

Safety switches, which operate the motor only while the switch is held in the closed positions should be used.

Grounding the shell by means of a third wire or central grounding is the most practical method of safeguarding against shock. Nonconductive material, such as plastic, for shell and handle minimizes the shock hazard but plastic is more easily broken than metal. \* \* \*

## Lubrication for High Speeds

OPERATING at high speeds on countless bearings, modern machines need lubrication at frequent intervals. New lubricants and central pressure lubricating systems have been developed to meet these needs.

Such an important part of a preventive maintenance program as lubrication should be handled on a definite schedule.

Lack of lubrication results in hot bearings, shutdowns, and fires.

Over-oiling motor bearings causes oil to drop or be thrown on insulation of electrical wiring. Oil deteriorates the insulation, exposing live conductors that will are and cause fires or electrically charge ungrounded surfaces. Oil on the floor creates slipping and fire hazards.

A survey of plant equipment will determine lubrication requirements. This information should be entered on machinery records.

Commonly used lubrication methods are:

- 1. Capillary oilers.
- 2. Wick oilers.
- 3. Ring and chain oilers.
- 4. Gravity feed oilers
- 5. Pump feed oilers.
- 6. Cartridge oilers.

Some machines have hundreds of remote bearings, and these can be served efficiently and economically by centralized systems. Clean oil or grease is supplied under pressure from the central pumping unit to every bearing.

The lubricant is renewed as often as the machine and operation require. This may be once or twice each shift or several times an hour.

On some systems an indicator signals delivery to each bearing of the correct amount of oil.

With a central pressure system there is no need to stop the machine for lubrication. The hazardous job of crawling over machines is eliminated.

Pressure lubrication systems require special greases. Silicone grease, one of the newer lubricants, has shown unusual ability to stand up under high speeds and high temperatures.

#### For Older Installations

With new machines, efficient lubrication facilities are usually built in. Older installations were designed for the oil can, and it may not be practicable to add an automatic system. In such cases one or more of these methods may be used for reaching remote bearings:

1. A service platform or runway giving access to several bearings. Moving parts of machinery should not project over platforms. If this is unavoidable, these parts should be enclosed.

 A small car suspended from an overhead I-beam enables the oiler to travel parallel to the line shaft and reach bearings with his oil can or grease gun.

3. Long-spout gravity flow or forcefeed oil cans enable the oiler to stand in the clear. Some cans have spouts long enough to reach overhead lineshaft bearings from the floor.

Circle Item No. 149-Reader Service Card

 Oil reservoirs at individual bearings with control devices operated with hand poles.

Extension pipes on bearings where grease or oil cups are in the danger zone. These may not be practical where low temperatures make it difficult to force oil or grease through the pipes.

#### Machine Guards

-From page 197

Nevertheless they can cause permanent disabling injuries and should not be neglected.

Individual motor drives and modern designs with moving parts enclosed have eliminated much guarding on the job. However, some guards still must be added when machines are installed.

#### Materials for Guards

Sheet metal, perforated metal, expanded metal, heavy wire mesh, or bar stock may be used for most types of guards.

Transparent plastic is used where inspection of moving parts is necessary and the strength of metal is not needed.

Shatterproof glass is used in similar situations, particularly where illumination of guarded parts is es-

#### MECHANICAL APPARATUS INSPECTION

Check the points listed below. Make recommendations to cover unsatisfactory conditions so that they can be corrected promptly.

POWER TRANSMISSION	E	N	10	25	UR	Œ	
OR GUARD RAILS						(	OK
Pulleys, flywheels							
Gears, sprockets, chains							
Belts: vertical, horizontal	١.						
overhead horizontal							
Belt shifters							
Keys, setscrews, collars,	CC	up	ling	gs			
Shafting							
Clutches							
Lubrication facilities .							
CONTROLS							
Electrical starting device	24						
Lockout devices							
Tripping devices: foot, h	ar	ıd					
POINT OF OPERATION	G	UA	RI	DS			
In place							
Condition satisfactory .							Ħ
Correct adjustment							H
Correct adjustment							

NSC Safety Instruction Card No. 778.

National Safety News, March, 1959





## USE MODERN Safety Drill Table

Saves fingers! Saves time! Replace your present drill table with the Modern Safety Drill Table—then drop in the work and drill. Eliminates dangerous, hand held, small jobs. Handles odd, irregular shapes and sizes without V-blocks, clamps or parallels. Sizes for every need, with diameters from 8" to 27½". Guaranteed to save its cost in labor alone in 6 months. Write for literature,



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PRES-VAC SAFETY FEEDERS feed blanks to press from a safe distance of 14 inches—BY AIRI—maximum protection to operators and handling costs kept at a minimum.

Save those fingers. \$3500



AIR BLAST VALVES
eject parts safely with
each stroke of the press—
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VAC-U-MATION DIVISION

Body and press shank are one piece with flanges to hold type chase in position. Type chase in position. Type chase in position. Type chase in position in press.

Body and press shank are one piece with flanges to hold type chase in position. Type chase in position in press.

Write for Catalog 100

SAFETY M.E.CUNNINGHAM CO.

1053 CHATEAU STREET, PITTSBURGH 33, PA.

Circle Item No. 152—Reader Service Card

sential and the flexibility of plastic is not required.

Where flying particles may mar safety glass or plastic the surface may be protected by replaceable glass covers.

Wooden guards are relatively low in strength but are sometimes used where splashes and fumes from corrosive substances would attack iron or steel.

Aluminum or other soft metals may be used where resistance to rust is essential, or where machinery may be damaged by iron or steel.

#### Supervision

Frequent checks should be made to see that instructions are observed and that safety devices are functioning.

Operators occasionally make safety devices ineffective in an attempt to speed up production or make operation easier. This is especially frequent with two-hand controls. Operators should be warned of the hazards involved and instructed in the use of safety devices. \* \* \*

#### **Woodworking Machines**

Circular saw. The circular table saw is one of the most useful of woodworking power tools—and one of the most dangerous. It causes more permanent disabilities than any other machine in the woodworking industry and among do-it-yourself fans.

Rim speed of a circular saw should not exceed 12,000 fpm, unless the saw has been manufactured for a higher speed and is so marked. At high speed, the teeth are almost invisible.

A crosscut saw should not be used for ripping nor a rip saw for crosscutting.

Following are important points in guarding:

1. Saw must be equipped with a hood that will cover it to at least the depth of the teeth.

2. Hood must automatically adjust itself to thickness of stock and ride on the stock. Then space between bottom of guard and material must be no more than ½ in.

3. Exposed parts of saw blade under table must be guarded.



SAW GUARD of transparent Plexiglas can be adapted to many operations. The work can be seen clearly. (Brett-Guard Co.)

- 4. There should be a clear view of saw at point of operation.
- 5. Guards should be designed and constructed to avoid vibration.
- 6. All teeth should be even in length.
- 7. Blade should not be lumpy or warped.
- 8. Depth, size, and shape of gullets should be such as to let sawdust discharge freely. Bottom of the gullet should be round.
- 9. Cut in wood should be a trifle wider than thickness of saw blade.
- 10. Saw must be discarded if it has a crack longer than 5 per cent of diameter, unless diameter is reduced to eliminate crack and tension is corrected.

Swing cutoff saws. Swing cutoff saws must have device to return the saw automatically to back of table when released at any point. Fiber rope or cord must not be used in device.

Limit chains, positive stops, or table extensions must be provided to prevent saw from swinging beyond front edge of table.

Where it is possible to pass behind a swing cutoff saw, rear of saw must be completely housed when saw is in back position. Housing must include swing frame as well as saw.

Manual-feed ripsaw. A spreader must be provided to prevent pinching or binding. It must be slightly thinner than the saw kerf and slightly thicker than the saw disk.

Antikickback fingers (dogs) of steel should be designed and installed so as to be effective for material of all thicknesses, \* \* \*



# Lock-Out Costly Accidents



Permits several workers to "feel safe" while working on equipment. No one can "turn on" the switch or valve until the last worker has removed his lock.

OSBORN Manufacturing Corp.
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STO POSTLY ACCIDENTS

Reduce Insurance Costs - Cut Time Loss - Save Lives!

STANDARD WHEEL GUARDS ... on your portable tools

STOP costly accidents with MORRISON Standard Wheel Guards! Safety codes and laws REQUIRE guard protection. Specify MORRISON for maximum safety...lighter weight...lower cost...greater strength. Full protection for operator with minimum interference with work.

Remember, MORRISON also makes revolving cup guards. There is a MORRISON Guard for every application . . . all are made to comply with American Standard Safety Code.

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### SAFEGUARD

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Safety & High Proc



-fob. Die Enclosure Material for a quick low-priced Die Enclosure Program



Traveling Barriers for Automatic Dual Protection

Whatever your preference in press guards, let Safeguard help solve your problems.

For information on-

1. Pullout Guards

2. Electronic Monitors (Insures the use of pullout guards)

3. Individual Die Enclosures 4. Adjustable Die Enclosures

5. Fixed Cable Guards (For no hands in the die feeding without enclosures)

6. Traveling Barrier Guards 7. Riveter Guards

### SAFEGUARD Mfg. Co.

odbury, Conn.

Circle Item No. 155-Reader Service Card

#### Electricity

-From page 200

tection of both personnel and equipment. These devices open the circuit automatically in the event of excessive current flow caused by accidental ground, short circuit, or overload.

A link fuse is a strip of fusible metal between two terminals of a fuse block. If exposed, it may scatter hot metal when it blows.

The explosion fuse is used in central stations, powerhouses or on overhead lines. When it blows, the gases generated aid in quenching the arc.

Plug fuses are used on circuits which do not exceed 30 amperes at not more than 150 volts to ground. The type which cannot be bridged inside the holder is recommended.

A cartridge fuse has a fusible metal strip enclosed in fiber tubes. Available are those which indicate when the fuse is blown and the refillable type in which fusible elements may be replaced.

Insulated fuse pullers should be kept on hand for pulling and replacing fuses. In installations complying with the code, fuses are protected by a switch which de-energizes the fuses when opened. If the fuse is not protected by a switch, the supply end of the fuse should be pulled out first, and in replacing, the supply end should be inserted last.

Circuit-breakers are used in high voltages or large current capacity circuits and are becoming more common in many kinds of circuits. They may be instantaneous in operation, equipped with timing devices, manually or power operated.

#### **Switches**

Types of switches include snap switches, knife switches, enclosed externally operable air-break switches, and oil switches. Those designed for controlling individual motor and machine tools and for lighting and power circuits are of the enclosed type.

Switches, fuses, and automatic circuit breakers should be plainly marked, labeled, or arranged to afford ready identification of circuits or equipment supplied through

Open-knife switches are undesirable because of exposure of live parts and because of the arc formed when the switch is open. Knife switches should be enclosed in grounded metal cabinets having a control lever extending through a slot in the cover.

Oil switches have contacts which operate while submerged in oil. They are especially desirable in circuits of 750 volts or more and may be used also in lower voltage

Snap switches, such as push-button or toggle types, have live parts enclosed. Flush switches should be installed in metal boxes, and surface switches used in open wiring and moulding work should be mounted on porcelain or plastic



Write for Illustrated catalog. CALUMET STEEL CASTINGS CORP.

1638 SUMMER STREET . HAMMOND INDIANA Circle Item No. 156-Reader Service Card National Safety News, March, 1959 sub-bases. These switches should indicate whether the circuit is open or closed.

Snap switches are preferable to key or pull-chain sockets. Key sockets, if used, should be porcelain, plastic, or other nonconductive material. Pull-chains should contain nonconductive links.

Protection against accidental shock from live electric parts, such as switchboards, fuse panels and control equipment, is obtained by insulating the floor area within reach of live parts.

For low-voltage exposure, dry wood floors without metal parts, or insulating mats, may be used. Mats should be nonconductive and moisture resistant. \* \* \*

#### Wire Rope

-From page 183

Strength and other qualities are the same for preformed and nonpreformed rope of the same size, grade and construction.

#### Slings and Fittings

Wire rope slings are widely used for heavy loads. Types of slings are grommet, single leg, two-leg bridle, 3-leg bridle, 4-leg bridle.

Legs can be single-rope doublerope, grommet, braided single, or braided double.

Load-end fittings can be loops, links, hooks, chokers, sockets, shackles, equalizing thimbles, slip-through thimbles, plate clamps, or special.

Safety hooks on cranes, hoists, and other lifting equipment prevent the load from jarring loose from the hook until the hook is unlocked manually. The latch also acts as a gauge to indicate whether the hook is sprung or not.

Complete assemblies can be obtained from manufacturers who should be consulted when slings are to be used for special purposes.

Maximum strength is obtained when all legs of the sling are vertical. The smaller the angle formed between the legs of the sling and the horizontal, the greater the tension on the legs and the less weight which can be lifted.

Where a load has sharp corners,

pads or sling saddles should be placed between load and sling. Where there are sharp bends over an unyielding surface, tension on outside strands may injure the rope.

#### How to Order

When ordering wire rope, the following information should be furnished:

- 1. Length.
- 2. Diameter.

 Construction—number of strands; number of wires per strand; arrangement of wires in strand, such as Seale or Filler Wire.

4. Type of Fabrication—if preformed rope is desired, it should be specified. Otherwise, nonpreformed rope will be furnished.

5. Finish—galvanized finish should be specified if required. Otherwise, bright rope is usually furnished.

6. Grade—improved plow steel, plow steel, iron.

7. Lay-regular lay right lay will

Circle Item No. 157-Reader Service Card



### JUNKIN ELECTRO-LOCK SHIELD

MAXIMUM visibility... MAXIMUM protection!

The Junkin Electro-Lock Shield permits the operator to see clearly the work he is performing and at the same time protects him from severe injury or eye damage. Interlocking power and light circuits will not permit the machine to operate unless the shatter-proof Junkin Electro-Lock Shield is in complete protective position. This feature guards unthinking operators against mishap.

Junkin SAF-SIGHT SHIELD

The Saf-Sight Shield is a simple, practical, low-cost means of providing basic protection.



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Protect Workers
From Injury
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GUARD

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Designed for factories and institutions to protect personnel from bodily injury This fan guard prevents hand, arm and head injuries. Made of strongly woven cotton mesh fabric, with one-quarter inch openings. It is weahable, mildew proof, non static, and won't interfere with the normal flow of air. Cover protects back and sides of fan as well as the front.

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be furnished unless otherwise specified. Lang lay or left lay is furnished on request.

8. Core—specify fiber core, independent wire rope core, or wire strand core.

 Lubrication—type of lubricant is not specified unless there are unusual service requirements. Each construction and grade of rope is treated with a lubricant adapted to that particular rope for a wide range of service conditions.

10. Use for which rope is intended.

#### **Wire Rope Lubrication**

All wire rope should be treated at regular intervals with a lubricant to keep it pliable and to prevent rust.

Idle wire ropes are most susceptible to rust. It is important that they are well lubricated when not in service.

The best lubricants are those furnished by manufacturers and dealers especially for lubricating wire rope.

#### Fiber Rope

-From page 194

with age. When rope is used at infrequent intervals, its age should be considered in its use and retirement.

New rope, before being placed in service, should be thoroughly inspected throughout its length. It should be uncoiled by laying the coil on the floor with inside end down; then reach down through the center of the coil and pull this end up, unwinding the coil counter-clockwise. If the rope uncoils in the wrong direction, the coil should be turned over and the end pulled out on the other side.

Rope loaded over 75 per cent of its breaking strength will be permanently damaged. Damage can be detected by examination of inside threads, which will be broken in proportion to the overload.

Kinking is highly destructive to rope. It may cause failure when the rope is again put under strain.

Sometimes ropes become kinked after use. One method of removing these kinks is to open the coil and recoil left-handedly. When the coil is completed, the free end is brought through the coil and the rope is then coiled right-handedly.

Uncoiling the rope and stretching it out in a single length is another

method of unkinking where space permits.

Rope should be stored in a dry place where it will not be exposed to high temperature and where air may circulate through the coils.

Rope deteriorates quickly if saturated with water and not properly dried. Alternate wetting and drying will also cause rapid deterioration.

When lengths of rope must be joined they should be spliced, not knotted. A well-made long splice will retain up to 90 per cent of the strength of the rope; a knot, only 50 per cent.

Inspection should include examination of the entire rope for wear, abrasion, broken or cut fibers, displacement of yarns or strands, discoloration, or rotting.

To inspect inner fibers, the rope should be untwisted in several places to make sure they are bright, clear, and unspotted.

Rope should be replaced when it has lost its feel of pliability or stretch, or when the fibers have lost their luster and are dry and brittle. \* \* \*



KEY-BAK is worn on the belt. Pocket-watch size reel, in highly-polished chrome finish. Swedish clock-spring reels in 24" long STAINLESS STEEL chain. NO DANGEROUS DANGLING CHAINS TO CATCH ON MACHINERY and CAUSE ACCIDENTS.

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Attach SAF-T-CHUCK KEY-BAK
to all drill presses. Chuck key is
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springs out when released. It
can NEVER, NEVER, NEVER be
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Circle Item No. 161—Reader Service Card National Safety News, March, 1959



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INDUSTRIAL BUILDINGS are involved in a large proportion of the heavy loss fires reported each year. Each day nearly a hundred industrial plants suffer serious damage from fire. Of those destroyed, some 40 per cent are out of business permanently. The cost of replacement of plant and equipment is often prohibitive.

The fire-safe plant has: fire-resistive construction, limitation of fire areas, segregation of hazardous storage and processes, protection of openings in walls and between floors, automatic systems of detection and extinguishment, and portable apparatus.

What's missing in the above list? Men trained to extinguishment and rescue work who will instinctively do the right thing in an emergency.

## **Fire Fighting Methods**

Control fire and protect property through:

- 1. Fire prevention engineering
- 2. Early detection and extinguishment
- 3. Limiting damage due to fire and fire extinguishment
- 4. Preventing personal injuries from fire or panic

CAUSES OF FIRE. The majority of fires in industry can be traced to four general causes:

1. Open flames, high temperatures. Stoves, furnaces, salamanders, welding and cutting, lamps, heated pipes and surfaces, matches, smoking.

2. Friction. Hot bearings, belts, cutting, grinding.

3. Electricity. Defective wiring, arcs, sparks, heat resistance, static electricity.

4. Chemical reactions. Spontaneous ignition, reagents, acids, oxidizing agents.

#### **Extinguishing Methods**

Many types of apparatus have been developed for various risks but all extinguishing methods are based on one or more of three principles:

- 1. Eliminate oxygen from air.
  - (a) Replace air with inert gas.
  - (b) Exclude air with a non-combustible cover.
  - (c) Use a chemical which will dilute oxygen in air below point required to support combustion.
- 2. Remove fuel supply.
  - (a) Shut off flow in liquid or gas supply lines.
- (b) Remove burning fuel.
- Reduce temperature below ignition point.
  - Cool burning material with water or chemicals.

Fire prevention engineering. The services of a qualified fire prevention engineer often will be helpful in planning prevention and protection.

First step is a survey of the plant—layout, manufacturing processes, materials handled, storage methods, and fire-protection facilities.

With this information, plans can be made for improving structure

and layout, installing additional equipment where needed, and training employees in prevention and extinguishment.

Water supply. Water is the most widely used and effective extinguishing medium for most fires. Water in solid streams should not be used for fires in electrical equipment, flammable liquids, and materials where use of water would be hazardous and water damage excessive.

In determining supply requirements, structural conditions and processes, and the number of streams that might be required to cope with a blaze must be considered.

**Pumps** should supply enough streams at adequate pressure. Allowance should be made for pumps

out of service for repairs and for continuity of pumping in event of power failure.

Hydrants should be located throughout the plant area to give adequate coverage of all buildings, and preferably not more than 50 ft. from any building.

Maintenance must be systematic. When hydrants are installed, provide drainage to minimize the danger of freezing in cold weather. Hydrants should be kept clear of snow and a thawing device provided

Standpipe and hose provide effective protection inside buildings when used by men trained in handling heavy streams. They are a valuable auxiliary to the city fire department. Piping should be of sufficient size for buildings of more than four stories.

Couplings. All outside hydrant nipples and hose couplings should have American Standard 2½-in. fire hose thread.

The 2½-in. single jacketed rubber-lined hose is ordinarily used outside. It is flexible and lightweight. Double-jacket hose is used principally for rougher service in municipal fire departments.

-To page 230



FIRE-FIGHTING UNIT mounted on a skid is carried on a low-lift platform truck. Unit carries dry chemical and carbon dioxide extinguishers, small water tank, and auxiliary hose for local outlets. (Yale & Towne Manufacturing Co.)

## **Portable Extinguishers**

#### First line of defense against fire

PORTABLE extinguishers can be brought into action in the vital minutes before the company or city fire department can reach a blaze—sometimes even before sprinklers can operate. Their prompt use by trained employees has prevented heavy losses from both fire and water.

The limitations of portable apparatus should be recognized in planning protection. First-aid extinguishers are not a substitute for heavy-duty or automatic equipment.

Alarms should be turned in promptly while extinguishers are being used. Many large-loss fires have occurred because of delayed alarms.

Types of portable extinguishers in general use are:

- 1. Anti-freeze.
- 2. Carbon dioxide.
- 3. Dry chemical.
- 4. Foam.
- 5. Pump tank.
- 6. Soda and acid.
- 7. Vaporizing liquid.
- Water-filled (gas cartridge or air pressure).
- 9. Water pails.

Some extinguishers are available in both hand and wheel types. The latter is moved easily and has extra extinguishing capacity.

#### For Class A Fires Only

These extinguishers should be used only on Class A fires in ordinary combustible materials—never on flammable liquid, grease, or electrical fires.

Anti-freeze solution extinguishers are of two basic types. One uses a cartridge which releases expellant gas when punctured. The other uses a shut-off valve which retains the gas in the same single chamber with the extinguishing solution.

Extinguishing agents are either calcium chloride or alkali-metal salt solutions (loaded stream). The latter are more effective than soda-acid extinguishers of equal size.

Only recharges furnished by the manufacturer and specified on the extinguisher nameplate should be used.

Solutions will give protection at temperatures as low as -40 F.

Water-filled extinguishers are similar to the anti-freeze type but use plain water as the extinguishing agent. Either gas cartridge or stored air pressure may be used as the expellant.

Pump tanks are covered containers, usually cylindrical, with a double-action pump, discharging through a short length of hose and

#### HOW TO SELECT A FIRE EXTINGUISHER

	Carbon Dry Vaporizing Foam Dioxide Chemical Liquid				Soda Acid	Water	
CLASS A Paper, wood, excisier, rubber and general combustible fires requiring cooling and quenching.	Small Surface Fires Only	Small Surface Fires Only	Small Surface Fires Only	YES Foam clings to vertical surfaces, wets and smothers.	YES Soda-Acid is see- nomical pretection quenches and cuois.	YES Water is excellent protection; it cools and quenches.	
CLASS B Burning liquids (gasoline, paint, oil, grease, etc.) demand a smothering action for quick extinguishment.	YES Has no ill effects on food and leaves no residue.	YES Chemical smothers fires	converted into a gas	YES Heavy foam blanket on surface of burn- ing liquids smothers	will spread liquid		
CLASS C Live electrical fires (motors, switches, appliances, etc.). A non- conducting extinguishing agent must be used.	YES Carbon diexide is non-conductor; will not damage costly electrical equipment or leave residue.	YES Dry chemical is non- conductor of elec- tricity.	YES Liquid is non-con- ductor, and will not damage equipment.	NO Feam is a conductor and should not be used on electrical equipment.	NO Should not be used on live electrical equipment; basic water content will conduct.	NO Water, a conductor should not be used on live electrical conductor.	
UNDERWRITERS' CLASSIFICATIONS	2½ & 5 lb. B-2, C-2 10 lb. B-2, C-1 15 & 20 lb. B-1, C-1 and up	B-1, C-1	1 & 1½ qt., B-2 C-2 1 & 2-gallon, B-2, C-1	A-1, B-1	A-1	A-1	
SUBJECT TO FREEZING	No	No	No	No	NO	Yes, unless chemical is added.	
EXTINGUISHING AGENT	Carbon Diexide	Dry Chemical	Heavy vapor formed from liquid by heat.			Water	
RANGE	5-10 feet	10-25 feet	20-30 feet	25-35 feet 20-40 feet		35-50 feet	
EFFECT ON FIRE	Smothers	Smathers	Smothers	Smothers and Cools	Cools and Quenches	Cools and Quenches	

Fire Equipment Manufacturers' Association



MOBILE EMERGENCY UNIT developed at Reading Company's locomotive shops. It carries extinguishers for all types of fires, gas masks, first-aid kit, ladder, wire cutters, rope, fire blanket, and other emergency items. Fire blanket is released from container by pulling cord.

a nozzle. The tank is filled through a removable cap at the top.

For low temperatures, antifreeze solutions are used.

Water pails. The most useful type is the 12-qt. size with flat bottom, made of 24-gauge galvanized iron. A loose-fitting cover keeps out dirt and retards evaporation. Pails should be painted bright red with FIRE in large letters.

If calcium chloride anti-freeze solution is used, pails should be coated inside, first with red lead then with asphalt-base paint. Calcium chloride of "fire protection grade" should be used.

Soda-acid extinguishers have an outer container holding a charge of sodium bicarbonate dissolved in water and an inner container of acid. They are operated by inverting, which allows acid and bicarbonate solution to mix. Carbon dioxide gas is generated with sufficient pressure to propel the contents.

Common size is 2½ gals. It provides a stream 30-40 ft. which lasts about 1 minute.

#### For Class A and Class B Fires

These extinguishers are suitable for Class A fires in ordinary combustibles and Class B fires in flammable liquids where a blanketing effect is needed. Never use on electrical fires.

Foam. The chemical foam extinguisher is shaped like a soda-acid

extinguisher and operated the same way. In place of plain water it contains a foam-making ingredient.

When the extinguisher is inverted, the chemicals mix and force out a foaming stream. The hand model contains 2½ gals. of liquid and generates 8 times that amount of foam.

In purchasing charges, brand and name of manufacturer should be specified.

#### For Class B and C

Only these extinguishers may be used safely on Class C fires (electrical equipment) as well as on Class B fires (flammable liquid). They do not contain water and need no winter protection.

Carbon dioxide. Portable carbon dioxide extinguishers consist of a storage cylinder, a hand-operated valve, and a discharge horn connected to the valve by flexible hose or a short piece of metal tubing.

These extinguishers are discharged by operating the valve by a handwheel, squeeze grip, or trigger.

The gas is noncorrosive and leaves no residue. It has no lasting blanketing effect and is not considered effective for Class A fires. These extinguishers have a comparatively short range.

Extinguishers are available in several sizes in both hand and wheel-mounted models containing from 2½ to 750 lbs. of carbon dioxide.

Dry chemical. This type of extinguisher consists of a container of dry chemical ejected by carbon dioxide, nitrogen, or dry air stored in cartridges or cylinders. It is operated by a quick-opening valve with on-off control of the discharge.

Dry chemical extinguishers may be used safely on fires in flammable liquids and electrical equipment. They should not be used on telephone switchboards or delicate contactors or relays. Because of the insulating qualities of the chemical, extreme care would be needed in removing the residue.

For Class A fires these extinguishers are less effective than those which provide a wetting action.

In recharging, only products recommended by the manufacturer should be used.

Vaporizing liquid. The extinguishing agent is specially treated carbon tetrachloride or chlorobromomethane. The charge is expelled by a hand pump or by air, nitrogen, or carbon dioxide pressure.

Most familiar model is the 1-qt. size frequently carried on motor vehicles and motor boats. Smaller sizes do not provide adequate protection.

Larger units of ½- to 3-gal. capacity are operated by stored gas or air pressure.

These extinguishers should be charged only with the liquid specified by the manufacturer and taken from previously unopened contain-

**Protection from freezing.** Carbon-dioxide, vaporizing-liquid, and dry-chemical extinguishers won't freeze.

Foam and soda-acid extinguishers should be installed in heated cabinets.

Water-filled extinguishers, pump tanks, and fire pails use calcium chloride solutions.

Recharging. Commercial carbon tetrachloride should not be used for vaporizing-liquid extinguishers. It may cause deterioration of the shell and interior mechanism. Liquid furnished by manufacturers is treated to remove impurities and to depress the freezing point.

Before recharging foam and soda-acid extinguishers, the shells and all parts should be thoroughly rinsed with warm water. \* \* \*

# Armed for your complete fire protection!

These famous brands, consolidated under a single organization, comprise the most complete line of fire protection products and services ever offered. Representatives of each of these brands are armed with dependable equipment, application experience and professional services to guard you against every fire hazard.

This high-quality, competitively-priced equipment includes approved fire extinguishers; automatic sprinkler systems; carbon dioxide, dry chemical and foam systems; fire hose, nozzles and couplings; industrial and municipal fire alarm systems; and accessory fire department supplies including ladders, sirens, clothing, breathing apparatus, first aid kits, etc.

Look for these famous brand names, sold through fire equipment specialty firms and leading industrial distributors. Consult the yellow pages of your telephone directory under "Fire Protection Equipment"

THE FYR-FYTER COMPANY

ATLANTIC COAST REGIONAL OFFICE P.O. Box 750, Newark 1, New Jersey

CENTRAL STATES REGIONAL OFFICE 221 Crane St., Dayton 2, Ohio

PACIFIC COAST REGIONAL OFFICE 132-140 Hawthorne St., San Francisco 7, California

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Representatives and Distributors in all principal cities



## **Automatic Protection**

Detection and alarm systems, automatic sprinklers

THE WELL-PROTECTED PLANT supplements the skill and vigilance of plant guards and watchmen with automatic systems for detection, warning and extinguishment and supervisory systems for watchmen.

Alarm systems range from coded blasts on the factory whistle to intricate automatic systems.

Sirens or special whistles are often used to avoid confusion with the regular whistles.

Where municipal fire protection is available, an alarm box connected with the city fire department may be located near the plant entrance or in one of the buildings. Auxiliary boxes may be placed at strategic points.

A direct connection to the nearest fire station offers important protection. Such a system may be operated manually or by a water alarm device.

#### **Supervisory Systems**

Watchmen's supervisory systems transmit and record signals made at watchmen's key stations. This protection is frequently combined with fire-alarm systems and supervision of sprinkler systems. A plant guard's failure to check in at any station along his route is promptly recorded at the control desk or panel.

Such supervision has checked many incipient fires, prevented robberies, and brought aid to watchmen rendered helpless by accident or illness. It has also prevented sprinkler-caused water damage.

These operate on three main plans:

1. Central station system. Signals are transmitted to an independent central station where they are recorded and proper action for the emergency taken. The central station may serve several companies.

2. Proprietary system. Similar to a central station but controlled and operated by the owner of the protected property.

3. Local system. Owned and operated by the protected company but does not have an operator constantly on duty at a central station.

#### **Detectors and Alarms**

Automatic detection and alarm devices may be operated by heat or smoke.

Heat-actuated systems are of two types: Temperature-rate-of-rise, or fixed-thermostat.

Temperature-rate-of-rise systems operate on the principle that air expands when heated. Tubing contains air at atmospheric pressure. Heat of fire expands air, forcing it to travel in opposite directions to diaphragms which close and sound alarm. Features in design prevent false alarms from normal temperature changes or even short sudden surges of heat.

Fixed-temperature thermostats are set for some specific temperature well above normal. When room temperature reaches that level, an alarm is sounded.

Smoke detectors detect deep-

seated smoldering fires and give a signal before flames are visible. Continuous samples of air are drawn from protected spaces and passed through an analyzer tube. Here smoke passes through a beam of light. Smoke reflects light on to photoelectric cells, increasing the cell output and sounding an alarm.

Nuclear detectors are sensitive and quick-acting. Combustion generates minute and invisible products not detectable at first by the human senses or by conventional detectors. In a nuclear detector a radioactive element in a ceiling-mounted chamber operate when there is a change in ionized air. Heat or smoke causes this change and sends the alarm signal to a monitor panel.

#### **Automatic Sprinklers**

FIXED SYSTEMS, particularly automatic sprinklers, are rated as the No. 1 defense against fire. They are needed wherever a building or its contents provides an appreciable amount of combustible material. Even fireproof buildings need protection for combustible contents and to prevent structural damage.

Sprinkler heads should be located not only to protect open areas but also under wide benches or tables, in closets, dryers, and other locations shielded from the discharge of ceiling sprinklers.



BEHIND THE SCENES with a sprinkler system. Fire chief inspects new installation at Dan Dugan Oil Company's Sioux Falls terminal. Piping system provides for drainage, a bell alarm which sounds whenever the system operates and for the use of the fire department's booster pump to increase pressures and amount of water delivered to any fire that might occur. The local fire department should be familiar with the plant's facilities.



# FLAMMABLES ENGINEERING BY PROTECTOSEAL

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. . . with portable parts basket speeds cleaning small parts—keeps worker's hands out of solvent. Fire baffle-dasher stopors, reduces yapors.

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Oval shape requires minimum storage space, permits natural, close-to-body carrying. Flexible spoutsafely speeds dispensing—no spillage. 5-gal. capacity.

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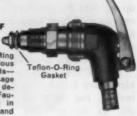
# NEW DEVELOPMENTS IN FLAMMABLE LIQUIDS SAFETY

New developments in the safe, productive use of hazardous liquids occur frequently. Often, these developments result from the needs of a single Protectoseal user—needs for which adequate safeguards did not previously exist. When these developments can be applied to operations in other plants, they are made available. The examples here are the most recent.



New Teflon O-Ring gasket impervious to most liquids prevents leakage due to gasket deterioration. Faucets available in stainless steel and brass.

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#### FLAMMABLES STORAGE CABINET

Approved now by N.F.P.A.; Board of Standards & Appeals, City of New York; Penna. State Police Bureau of Fire Protection—for storage of up to 45 gals.

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such as rubber cement. "Knife-like" closure blade over spout stops flow of liquid with clean "cutting" action no sloppage.

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This extra coverage is important because heat from a fire in an unprotected area would open more sprinklers, causing drain on the water supply and excessive water damage.

Essential parts of a sprinkler are a nozzle, a releasing device, and a deflector. The releasing device in most sprinklers is a soldered link element.

Various types of heads are available for use under a wide range of temperature conditions. Heads of too high a rating are slow to operate. A fire would gain considerable headway and open more heads than needed. Soldered links with too low a rating may become weakened and operate prematurely.

For normal room temperatures up to 100 F., ordinary sprinklers are used. When temperatures are higher, thermometer readings should be taken near the ceiling and ratings selected accordingly.

In the few cases where sprinklers have failed to function when needed, the fault has rarely been due to the sprinkler mechanism. Deficient water supply, freezing, defective dry-pipe valves, foreign material in the system, corrosion, obstruction of sprinkler heads by stock piles, or paint on sprinkler heads are among the causes.

Wet-pipe systems are used for most installations. Water to sprinkler heads is maintained under pressure and operation is immediate. This type requires protection against freezing.

Dry-pipe systems are used where there is danger of pipes freezing. Instead of water, air under pressure is maintained in the pipes. Opening of a sprinkler head releases air pressure, resulting in operation of a valve admitting water to the system. There is a slight delay between opening of sprinkler head and discharge of water.

After a fire, sprinkler heads should be replaced promptly.

#### **Sprinkler Supervision**

Flow of water in the system can be used to sound an alarm for fire and accidental leakage. The alarm check valve installed in a sprinkler riser can ring a hydraulic gong or an electric bell, or both.



SMOKE, FIRE, or even vapor will be detected by this ultraviolet-sensitive tube and alarms set off. (Minneapolis-Honeywell.)

A less expensive type, the waterflow indicator, is a paddle-like vane projecting into the piping. An electric bell sounds when the vane is deflected by flow of water.

Water-flow alarms are desirable where building contents are susceptible to water damage. They are useful supplements to watchman service.

Where central station supervisory service is available, waterflow alarms are transmitted to head-quarters, which calls the fire department and sends a man to the plant to investigate.

#### **Special Systems**

For special risks, automatic systems employing carbon dioxide, foam, or water spray nozzles may be installed.

Carbon dioxide is desirable where the system operates in an enclosed space and value of contents is high and subject to water damage. Carbon dioxide can be discharged either manually or automatically by heat-actuated devices.

Devices also close shutters, doors, windows, and dampers and stop blowers to confine the extinguishing gas. These systems are suitable for spaces containing electric equipment or flammable liquids.

Foam installations are suitable for tanks and operations involving flammable liquids, but not for electric fires. They usually operate automatically, with provision for manual operation.

Water spray systems are used to protect oil-filled electric equipment, such as transformers, oil switches, and oil piping and open tanks of flammable liquids. Water spray systems require expert installation.

Other systems for limited and specialized occupancies use vaporizing liquid, steam, and inert gases. For processes like paint dipping and tank operations using flammable liquids, a manually or automatically operated cover is an effective means of extinguishment.

Obstructed piping. A plant's fire protection may be crippled in an emergency when scale, stones, or other foreign material become lodged in the sprinkler system. Should a fire occur, discharge from the sprinkler heads would be insufficient to check the blaze.

Regular examinations can determine whether the system contains an excessive amount of foreign material. Methods include observations of flow from the test connection on top of the system, drain tests at sprinkler risers, or hydrant flow tests.

Uncoupling piping at strategic points and examining the interior, or test flushing representative feed or branch lines, will reveal obstructions. Examination may show individual sprinklers to be clear, but that does not necessarily mean the branch lines are. \* \*

#### **Types of Fires**

Fires have been classified by underwriters and manufacturers in three main groups.

Class A. Fires in ordinary combustible materials, such as wood, paper, textiles, and rubbish. They require quenching or cooling effects of water or solutions containing large proportions of water.

Class B. Fires in flammable liquids, such as gasoline, solvents, oil, grease, paint, varnish, and lacquers, where blanketing or smothering effect is essential.

Class C. Fires in electric equipment, such as motors, generators, and switch panels. These require a nonconductive extinguishing agent.

Fires in motor vehicles, aircraft and motorboats have the same problems of extinguishment as Class B but equipment must be portable. Extinguishing agents must be nonfreezing.

# Now...put your whole team ON THE FIRE!



More than a quarter of a million gallons of expanded FOAM using just one 1000-gal, tank of ROCKWOOD Double-Strength FOAM liquid! That's the amazing fire-fighting power of this compact, ROCKWOOD-equipped truck at a large eastern oil refinery.

ROCKWOOD Automatic Controls permit delivery of FOAM or water from any ar all of six 2½" FogFOAM Nozzles and Direct Manual Turret at any desired rates. System includes 500-gal, "starter" water tank.

## Let Rockwood handle variable flow rates automatically

Now you can set and forget FOAM liquid injection rates . . . release that "extra man" for active duty!

ROCKWOOD Balanced Pressure Proportioning System will automatically maintain FOAM liquid percentage precisely where you set it at any flow rate. No adjustment with valves and meters...no constant gage watching. Operate line outlets and turret individually or in any combination to deliver desired FOAM solution or water simultaneously; you're sure of maximum flexibility and complete reliability under all fire conditions.

ROCKWOOD Proportioning System gets you into action faster, too... keeps you going longer; water tank handles supply while you're hooking into local source. Tank of ROCKWOOD Double-Strength FOAM liquid doubles FOAMmaking ability... halves storage space!

Get complete details on ROCKWOOD Proportioning System and ROCKWOOD Double-Strength FOAM liquid. It's the high-efficiency, extra-economy combination for all hydrocarbon fire situations. Tested and listed by Underwriters' Laboratories, Inc.

#### ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

#### ROCKWOOD Double-Strength (3%) FOAM Liquid

- Costs less for equal coverage
- Doubles FOAM-making ability per unit
- Reduces handling and transportation costs by 50%
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- Protects in all weather



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### **The Plant Protection Force**

#### Training men to protect life and property

A COMPLETE PROGRAM of security requires training of employees in fire protection methods and employs guards and watchmen to patrol the property on the alert for fire and accident hazards and for intruders.

Organization and training pay off when the need arises. Men who have been drilled until the right procedure becomes automatic can be expected to perform their duties under stress.

Civil defense. World War II and the cold war have focused attention on the need for cooperative effort to meet emergencies. In many areas, industries have pooled their protection resources and have forces, trained in fighting fire, flood and storms and in rescue work and first aid, ready to serve their communities in emergencies. These groups have rendered notable service in many disasters.

Preparedness requires frequent and thorough inspections, competent maintenance of equipment, and expert supervision.

Organization. In many plants fire protection is a responsibility of the safety department. In larger plants, where there is more specialization, the safety department usually has an important part in the program.

Functions of an employee fire safety organization are:

To detect and correct hazards
 —to fight fire before it starts.

2. To maintain fire equipment for efficient action.

3. To become efficient in fire-fighting techniques.

To afford real protection, a fireprotection program must function 24 hours a day.

The fire-fighting organization may consist of a few trained employees with hand extinguishers or it may be a company fire department with full-time personnel. Regardless of its size, the municipal fire department should have a prominent place in plant protection plans.

City firemen should be familiar with the plant layout, its fire-fighting resources, and its hazards. They can also help in training and equipping the company's fire fighters.

A plant should not depend on the city fire department alone. Even under favorable conditions, it takes time for outside apparatus to reach the fire, and in an emergency, the department might be busy elsewhere.

Fire squads may consist of 5 or 6 men in each department. They act as inspectors, reporting and, where possible, correcting fire hazards. They should be taught the use of first-aid extinguishers by actual demonstration on small fires. They should also be impressed with the importance of turning in alarms promptly.

Trained men on the job will put out many fires before serious damage results and also help prevent

Fire brigades. For larger plants, hydrants and hose systems are basic protection. Trained men are needed to use them. Members of department squads can be members of the plant fire brigade.

These men should be familiar with the plant, its protective systems and water supplies. They should be drilled frequently by handling hose streams—no job for an amateur.

Each man should have a definite task. Some should be assigned to protecting goods and machines from water damage.

Fire departments. Some plants have full-time motorized fire departments. The department supervises the plant protection program and is trained in specialized fire-fighting methods.

Watch service. Watchmen are indispensable in protecting industrial property. They discover and correct fire hazards, detect outbreak of fire, extinguish incipient fires, and summon help when needed.



REALISTIC TRAINING. Armstrong Cork Company's fire brigade directs a stream of foam on a tank of burning solvent during annual field training exercises, Adapter sucks chemical solution from can into main water hose where it is coverted into foam.



#### HERBICIDES



#### GARLON . . . knocks out weeds and nuisance grasses, costs less than mowing

After simply mixing one part of Garlon\* with thirty parts of water, this man will be ready to spray away all the weeds and excess grass on this parking lot. With equal ease, he can control unsightly vegetation in any part of the grounds—along fences, in ditches, around loading docks, outdoor storage areas, roads and railroad tracks.

For controlling unwanted vegetation, Garlon is the one right product. It's brand-new—and unique from the research labs of Dow. It contains a special combination of powerful herbicides that control both broad-leaved weeds and grasses. It is a systemic killer—destroys roots and all. Garlon is easy to use. It mixes readily with water (one part to thirty) and goes a long way. One pint of Garlon will effectively treat

1000 square feet. Inexperienced maintenance men can apply Garlon with a simple hand sprayer and get professional quality results.

Some plants are still using mowers and man-hours to keep vegetation under control. But that's more expensive and less satisfactory than spraying with Garlon. Cost figures show that savings are substantial when you switch from mowing to spraying.

For more information on Garlon and modern chemical control of vegetation, fill in the coupon and send it to the down chemical company, Midland, Michigan, Agricultural Chemical Sales Dept. 209CX-3.

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#### THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

The watchman should be a mature, able-bodied man who is loyal and dependable. When the regular working force is absent, the safety of the plant may depend on him.

The watchman should be familiar with all parts of the fire protection systems, drains, and fire pumps. He should know how to operate extinguishers.

Recorded hourly rounds are recommended. Approved watchclock or supervisory systems record calls at each station.

Many fires occur just after a plant has closed down. The watchman should make his first round immediately after operations have stopped.

#### **Training Fire Fighters**

Essentials of training, as recommended by the National Fire Protection Association, are:

1. Officers and firemen should be kept fully informed on all phases of fire prevention and extinguishment. They should be encouraged to attend drill schools of the local fire department, or a fire college. Books, pamphlets, and magazines are available. The rapid development of industry constantly brings new fire hazards and extinguishing methods.

2. Drills should be held at least twice a month during paid time. Location of drills should be changed each time, so that men will become familiar with all conditions and areas of the plant and be able to cover any emergency that may arise.

3. Drills should include making hose connections with hydrants, unreeling and stretching hose without kinks, coupling and uncoupling, attaching play pipes, carrying hose up ladders, over roofs and through the interior of the building.

As a general rule, water should be turned on for all outdoor practice work, except during freezing weather. (This assumes rubber-lined hose; unlined linen hose should not be wet.)

4. Drills should be disciplined, moderately paced, and accurate.

5. Members of the brigade should be examined regularly to make sure they know the location of fire alarm boxes and the meaning of various fire alarm signals. \* \* \* separated by as much yard space as possible.

For buildings of more than one story, stairways, elevator wells, conveyors, and chutes should be enclosed with fire-resistive walls. Fire doors at openings check spread of fire to other floors.

Blank walls, fire shutters, or wired-glass windows offer protection against exposure fires. Open sprinklers are an additional safeguard.

Fire doors should either close automatically each time they are opened or closed by a heat-actuated device if fire should break out. The most common device is a fusible link

The releasing device should be located where it will be affected quickly by heat passing through the doorway and should be protected against mechanical injury.

Where flash fires may occur, quick-operating devices are preferable, except for doors used as exits.

Types of doors for various exposures have been approved by testing laboratories.

Fire shutters are used for windows where there is an exposure hazard from adjacent buildings. Shutters may be swing type (tin clad or steel) or rolling steel. The latter can be installed where space is too limited for swinging shutters.

Sliding shutters are not recommended where snow and ice might interfere with their operation.

#### **Construction That Resists Fire**

There is no such thing as a "fireproof" building but some types of construction can survive a fire with only minor structural damage.

Building materials should be noncombustible wherever practicable, although any material may be damaged by extreme heat.

Walls and openings should be planned to prevent rapid spread of fire. Large areas should be subdivided by fire walls, with openings protected by fire doors.

For nonhazardous occupancies heavy plank roofs and floors are permissible. Heavy timbers are slow burning.

Wooden walls, joisted quick-burning floors and roofs, and inaccessible combustible spaces should be avoided.

#### **Limiting Fire Areas**

Hazardous processes should be cut off by fire walls or fire-resistant partitions. Severe hazards should be housed in separate buildings.

Explosion hazards require explosion-venting windows or other means of relieving pressures to minimize structural damage.

Important buildings with combustible roofs and floors should be

#### FIRE PREVENTION CHECKLIST

#### Fire Extinguishing Apparatus

In proper place Clearly marked Unobstructed In working order

#### Housekeeping

Premises free of combustible materials | Metal containers for oily rags | No leaks and drippings of flammables | No rubbish | Passageways clear of obsfacts | Ostronomia

#### **Electrical Equipment**

#### **Heat and Flame**

No Smaking areas Gas jets off 
clearly indicated No gas leaks 
Ashes kept in metal 
containers 
Mot pipes clear of 
cambustible materials

NSC Safety Instruction Card No. 237.

#### **Weed Control**

WEEDS, sometimes called "unwanted vegetation," infest plant sites, parking lots, storage yards, railway tracks, roads, ditches, and other industrial and public areas. Their control is an essential part of plant maintenance.

Weeds and grasses take over in many locations where cutting or pulling is an expensive task. When dry they form a serious fire hazard. They also encourage rot and corrosion.

Around wood foundations, posts, lumber piles, and railroad ties they hold the moisture that encourages fungus rot.

Along fences and in yards where metal stocks are stored they accelerate corrosion. Fences, pipe, and fittings need more frequent replace-

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ment where uncontrolled vegetation shields these installations from the drying effects of sun and wind.

A rank growth of weeds will hide lurking objects where employees walk, such as along railroad sidings and switches and around parking lots. When wet with dew or rain these spots may become slip-

Many weeds present a health hazard due to allergies associated with such species as ragweed. Poisonous plants such as poison ivy and poison oak are a serious hazard.

Control of weeds in lawns is now relatively easy with various formulations of 2, 4-D.

Crab grass can be controlled readily with many commercial products without permanent injury to desirable grasses.

Brush killer formulations are widely used for control of woody plants such as poison ivy, willows, or sumac in grassed areas.

Nonselective killers. For some locations, complete elimination of all vegetation is desirable. On such areas, nonselective soil-sterilant types of herbicidal chemicals offer an efficient and economical means of handling the problem.

Sodium chlorate has been widely used and is quite effective in many cases. Because of fire hazards, its storage, handling, and use require numerous precautions.

Some newer weed killers are nonselective, long-lasting when applied to soil, nontoxic to persons and animals, and non-corrosive to metals used in plant installations. They are low in cost and can be applied by company gardeners or maintenance men without special equipment. They do not introduce a fire hazard

#### Cold-Weather Precautions

Extinguishers. In unheated locations, provide nonfreezing extinguishers, or heated cabinets for extinguishers which could freeze. Fill fire pails with nonfreezing solutions.

Fire pumps. Keep pump houses adequately heated.

Protect suction pipe and intake from freezing.

Hydrants. See that hydrants are tight and drain properly.

Keep hydrants and indicator posts unobstructed by snow.

Wet-sprinkler systems. Provide adequate heat in all sections, especially over week ends.

Repair windows and doors which are not weather-tight.

Dry-sprinkler systems. Make sure dry-pipe valve enclosures are well heated.

Check air pressures daily.

Check dry-pipe alarms.

Blow out drains and low points frequently.

Check pitch of all piping for pockets where moisture could collect and freeze.

Sprinkler tanks. Provide heating systems for tanks and be sure they are in good operating condition. Flush out circulating pipes and

Do not overflow tanks to prevent freezing.

#### OILY WASTE CANS



old rogs or combustionable material. Underwriters approved.

(#1717-8) - for use

In group D, class

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tions. Fully insu-

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From 6 to 25 gallons.

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for easy handling of flammable liquids. Underwriters labeled. In 1

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cleaning with Rammable liquids. gallon and 1 gallon sizes. Ap-

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CONTAINERS AND LIGHTS

#### SAFER! BECAUSE THEY'RE STRONGER

JUSTRITE Safety Cans - a maximum (15 lb.) lead Justrite Safety Can. "Double lock-seam" construction assures an unstretched coating of uniform thickness inside and out. Reinforcing ribs strengthen body of can. Cast malleable spout with self-adjusting cover will take hard use and keep

contents safe. A cast Spout Lip aids pouring, helps discharge "static."

JUSTRITE SAFETY LIGHTSheavy gauge, rust-proofed metal construction of lanterns and headlights. Seamless, cement-free construction of plastic flash-light cases. Exceed the requirements of Class 1, Group D.

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#### SAFETY HEADLIGHT

(#1704-8)- with belt clip for case and padded headband for light. Fully flexible with 1,500 ft. beam. Leaves both hands free.

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plants large and small . . . behind the guarded gates of highly-secret atomic installations and missile
centers—wherever complete fire protection is important, you'll find Ansul. • Industry
knows that only Ansul digs deep into basic fire research, that Ansul can be depended
on for the best answers to fire protection problems. • More than 20 years ago Ansul
began this search for new and better ways to prevent fire loss. Ansul pioneering
continues today with the introduction of new, improved fire fighting equipment and advanced
training techniques. • Put this knowledge and ability to work to help you build the
complete fire protection program that could someday save your plant from destruction.
• Start with Ansul people. Draw on their technical skills, their practical experience to solve
the fire protection problems you have. ANSUL CHEMICAL COMPANY, MARINETTE, WISCONSIN.



new products, new ideas for better fire protection

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Circle Item No. 169-Reader Service Card

# Spontaneous Ignition SPONTANEOUS IGNITIO

SPONTANEOUS IGNITION is a chemical action in which there is a slow generation of heat through oxidation of combustible material. Under certain conditions, oxidation is accelerated until the ignition temperature of the material is reached.

This condition requires sufficient air for oxidation but not enough ventilation to carry away the heat as it is generated.

Acute cases occur suddenly and explosively; in **chronic** cases heat generates slowly until ignition takes place.

Examples of substances subject to ignition are dry yellow phosphorus, which ignites on exposure to air, and quicklime, sodium, potassium, and calcium carbide, which heat when exposed to moisture.

Some materials may be stored for long periods, processed, packed and shipped with no signs of heating. The first warning may be the discovery of smoke. Uncertainty increases the hazard.

For spontaneous ignition there must be combustible material, moisture, oxygen, and a certain minimum temperature. Impurities in combustible material may affect heating.

At ordinary temperatures some combustible substances oxidize slowly and under certain conditions reach their ignition point. These include vegetable and animal oils and fats, coal, charcoal, and some finely divided metals.

Rags and waste saturated with linseed oil or paint often cause fires. They should be deposited in waste cans with covers (preferably selfclosing) and removed daily.

Best preventives are either total exclusion of air or good ventilation. With small quantities of material, the former is practicable. With large quantities, such as storage piles of bituminous coal, both methods have been used.

Temperatures above 140 F. are considered dangerous in coal piles. If temperatures rapidly approach or exceed that figure, remove the pile or rearrange it to provide better circulation of air.

Agricultural products susceptible to spontaneous ignition include saw-

dust, hay, grain, jute, hemp, and sisal, especially if exposed to heat or to alternate wetting and drying. Circulation of air, removal of external sources of heat, and storage in smaller quantities are desirable precautions.

Fires in iron, nickel, aluminum, magnesium and other finely divided metals are sometimes attributed to spontaneous ignition. This is believed to result from oxidation of cutting or lubricating oils, or possibly from chemical impurities.

Detailed procedure for prevention and extinguishment of fires in material subject to spontaneous heating is found in National Board of Fire Underwriters publications, Preventing and Extinguishing Fires in Soft Coal, Bulletin No. 30, and Spontaneous Ignition and its Prevention, Bulletin No. 51.

#### **Wetting Agents**

Added to water, wetting agents increase its penetrating power on burning materials. This "wet" water has proved effective in extinguishing fires in loosely packed materials such as cotton bales, peat, hay, and decaying leaves in forests. The needed penetrating action cannot be obtained by the velocity of a stream of ordinary water.

Wetting agents break down the surface tension that holds the film of water together. The solution has unusual spreading and penetrating qualities and it also is absorbed more quickly by solid materials and adheres to them more readily.

Wetting agents may be applied effectively and used with all types of standard fire apparatus where plain water is normally used.

Approved wetting agents are no more corrosive than plain water to steel, bronze, and copper. For continuous storage, such materials as cast iron, zinc, galvanized iron, diecast alloys, and painted surfaces should be avoided. Wetting agents, although not corrosive, may accelerate corrosion due to the cleaning and penetrating action which penetrates and loosens unbonded coatings which are not baked on.

Detailed information will be found in National Fire Protection Association's Standard No. 18, Wetting Agents.

Wetting agents which meet requirements of the standard are listed in Underwriters Laboratories Fire Protection List.



# JET TRANSPORT

...another advance in the age of flight



Each increase in jet fuel production augments the need for control of fire in flammable liquids.

Another vital industry served by

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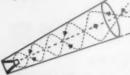


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• Available in 2½2, 5, 10, 15, and 20 lb. nominal sizes —approved by Underwriters and Factory Mutual Laboratories. 5 lb. and 15 lb. sizes are also Coast Guard approved.



● In addition to the usual center orifice, four other orifices, (two in 2½ lb. Model) discharge at right angles to the side of the horn, breaking the snow into minute particles for instant change into gas.

# AMERICAN JAFRANCE

# CARBON DIOXIDE

Like all American LaFrance products, these Carbon Dioxide hand portable extinguishers have the extras which mean faster, more effective fire protection for you. They feature the same, "pull pin, squeeze handle" operation that makes all American LaFrance extinguishers easier and faster to handle. Positive pressure valves and all other fittings are chrome. The extra-heavy molded plastic horn has unique, multiple orifices that break CO<sub>2</sub> snow into gas almost instantaneously.

For larger risks, American LaFrance offers wheeled engines in 50, 75 and 100 lb. capacities as well as custom-designed systems for permanent installation. For complete information or an actual demonstration, call or write today.

#### AMERICAN JAFRANCE

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#### **Static Electricity**

SPARKS resulting from static accumulations are a common source of fire. The hazard is particularly serious wherever there may be flammable vapors, gases, or dusts.

Cold, dry weather is most hazardous. A warm, humid atmosphere helps to draw off static charges.

#### Causes

Static charges result from:

- 1. Friction between small particles.
- Contact and separation of two unlike substances, one or both of which are nonconductive.

Gasoline and other flammable liquids flowing through hose, or dust-laden air through nonconductive passages, may produce static charges.

Belts and shafting. Static charges are generated on dry belts (particularly rubber or leather) by contact and separation of belt and pulley. Accumulations can be controlled by use of conductive rubber belting.

Belts can be grounded with sharppointed metal combs or metallic tinsel static collectors which are grounded.

Where highly flammable vapors may be present, chain drive or conductive rubber pulleys, rather than combs, should be used.

Conductive rubber belt dressings, if renewed frequently, are helpful.

Powdered materials. Finely divided materials falling through the air or blown through pipes may generate static electricity and ignite explosive mixtures of dust and air. Machines should be bonded and grounded at several points.

#### **Preventive Measures**

Humidity maintained at or above 60 per cent at 70 F. helps to prevent accumulation of static charges. High humidity is obtained by special humidifiers of steam jets installed on blower-type heaters.

Ionization of air also is used. Ionized air contains electrically charged particles which conduct static charges to grounded parts of machines. Ionization methods include gas flames, discharges of high potential electric current, and radi-

ation from radioactive material. These methods require expert installation and maintenance and may involve fire or health hazards.

Conductive shoes. Body static charges may create a hazard in areas which contain highly flammable dusts, gases and vapors. Shoes with conductive soles and heels help drain off charges. Their conductive value is reduced by foot powders and by wool, silk, or nylon socks. Cotton and rayon are safer.

Conductive floors should be installed in hazardous locations. Ordinary wax and other nonconductive floor finishes reduce the value of grounding measures. Special finishes for conductive floors should be used.

Automatic sprinklers should be provided inside bins and processing equipment containing combustible materials. Where water may cause reaction with or damage to material, inert gas extinguishers may be used. \* \* \*

## How Many Extinguishers?

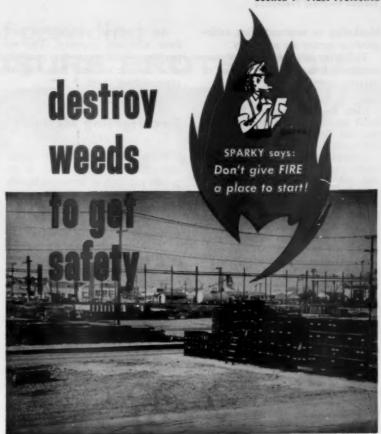
THE NUMBER of first-aid fire extinguishers for any occupancy should be determined by the jurisdiction having authority. Recommendations are based on the potential severity of any incipient fire. Factors include:

- Rapidity with which a fire may spread.
- Intensity of heat that may be developed.
- 3. Accessibility of fire.

Special hazards, in addition to ordinary hazards of the occupancy, require installation of additional and/or substitute units of prescribed type.

Methods of determining the number and type of extinguishing units required will be found in NFPA No. 10. Classification of fire extinguishers under both old and new methods will be found in the accompanying table.

Requirements as outlined in NFPA No. 10 are based on the provision of Class A extinguishers. Supplemental Class B or Class C units are to be provided where



new chemical kills weeds and grasses ... prevents regrowth a full season!

UREABOR® ... for industrial weed control

Here's the weed killer that's specialized for you! Yes, UREABOR was developed specifically to combat industrial weed problems and has proved effective. Maintenance men cheer this ready-to-use, dust-free granular weed killer—it's so convenient, so easy to apply dry. Effective rates of application are low—1 to 2 lbs. per 100 sq. ft. And, for treating large areas, special spreaders are available in both hand-operated and power-driven models. To learn more about UREABOR, write for literature today.



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blanketing or nonconducting extinguishing agents are necessary.

Following is a summary of recommendations for occupancies of varying severity:

Class I—Light hazard. Relatively small amount of combustibles, with incipient fires of minimum severity anticipated.

Examples: Office buildings, schools (exclusive of trade schools and shops) and public buildings. Limited areas within such buildings containing ordinary hazard occupancies are to be protected as required under Class II.

Class A extinguishers shall be provided throughout, so located that a person will not have to travel more than 100 ft. to reach the nearest device. At least 1 unit of extinguishing capacity shall be required for every 2,500 sq. ft. of floor area.

Class II—Ordinary hazard. Incipient fires of average severity may be anticipated.

Examples: Department stores, warehouses, and manufacturing buildings of average hazard.

Class A extinguishers shall be provided throughout, so located that a person will not have to travel more than 50 ft. to the nearest device. At least 1 unit of extinguishing capacity shall be required for every 1250 sq. ft. of floor area.

Class III—Extra hazard. Because of character or quantity of combustibles, extra severe incipient fires may be anticipated.

Class A extinguishers shall be provided throughout as specified for ordinary occupancies, with additional Class B and/or Class C extinguishers to be provided at the discretion of the authority having jurisdiction.

Examples: Woodworking, spray painting, and dipping.

Special provisions of NFPA No. 10 relate to occupancies requiring Class B and Class C extinguishers. \* \* \*

#### Look for the Label

Approved extinguishers carry the label of Underwriters' Laboratories or Factory Mutual Laboratories. They also carry this information:

- 1. Type of extinguisher.
- 2. Type of fire for which it is recommended (Class A, B, C).
- 3. Instructions for use.
- 4. Unit rating.
- 5. Instructions for inspection and recharging.

An approved extinguisher must have adequate capacity. The vaporizing liquid type, for example, must contain not less than 1 qt. of extinguishing agent. \* \* \*

#### **Fire Fighting Methods**

-From page 212

Rubber-covered hose is sometimes needed where there is exposure to fumes or corrosive liquids. Neoprene has been found superior to natural rubber for most uses. Dacron also offers numerous advantages.

The 1½-in. hose is useful for small fires and for wetting down fires after the blaze is under control. It can be handled by one or two men.

Playpipes and nozzles. Standard underwriters' playpipes throw an effective stream but are difficult to handle, particularly on ladders. The short, rigid playpipes with strap and ladder hook, with shut-off nozzles to reduce water damage, are more suitable for plant use.

Adjustable spray and straight stream nozzles (for both 2½- and 1½-in. hose) give water-curtain protection for firemen and a blanketing effect. They also provide solid streams for penetration.

Water spray (fog) nozzles are effective for oil fires. Water fog, owing to its low conductivity, can be used safely on electrical fires. Its effective range is only a few feet but this can be offset to some extent by using applicator pipes of varying lengths.

Foam-generating equipment is used where large quantities of flammable liquids are stored. For some exposures permanent generating equipment should be installed.

Foam systems may be either automatic or manually operated. There are two types of foam, chemical and mechanical.

Chemical foam is formed by a chemical reaction in which masses of bubbles of carbon dioxide gas and a foaming agent produce an expanded froth.

Mechanical foam consists of bubbles of air produced when air and water are agitated mechanically with a foam solution. \* \* \*

# Preventing Welding And Cutting Fires

All operations should be restricted to a specified area and before portable units may be moved, written consent of a qualified official must be secured. The location must be carefully examined before signing permit.

No cutting or welding should be done while sprinklers are out of service.

Equipment must not be used in presence of flammable vapors and liquids or tanks which have contained such materials.

Floors and surroundings must be swept clean and wet down. All combustibles should be relocated 30-40 ft. away. Remainder should be covered with asbestos curtains, metal guards or flameproofed covers (not ordinary tarpaulins).

Extra men should be provided to watch sparks. Ample fire protection equipment, such as hand hose, extinguishers or water pails should be provided.

When operations are in combustible buildings, men should be stationed on the floor below and possibly on the floor above. The areas including the floors above and below the one on which the operation is performed should be patrolled for at least half an hour after the work is completed.

If near the shutdown period, remaining employees or watchman also should be notified.

Cutting and welding equipment should be kept in good repair. Soapy water should be used in testing for leaks.

#### Safe Storage Cuts Fire Losses

Storage-area fires cause much of the fire loss in industrial plants. While fires do not occur as frequently as in manufacturing areas, damage per fire often is higher.

Suggestions for safe storage include:

Keep storage out of manufacturing areas.

2. Keep storage from below manufacturing processes unless the building is noncombustible and floors are watertight.

Storage rooms need sprinklers if either contents or building will burn.

# Two ways of providing EXPOSURE PROTECTION



TOO LATE

to prevent serious heat exposure, a valiant attempt is made by firefighters to prevent rupture of tankage, not already involved in flames, with relatively ineffective hose streams.

#### GRINNELL WATER SPRAY SYSTEM

shown under test at the Marietta, Ohio plant of the Bakelite Union Carbide Plastic Company, a division of the Union Carbide Corporation. Water — when it is applied in time and distributed over the surfaces efficiently by a properly engineered system—is most effective in limiting tank fires and controlling their spread.



Proper safeguards are uppermost in importance in protecting tanks which contain gases and flammable liquids in the event of fire. For example, tanks must be guarded against extreme heat exposure. Leaking gas, if it should develop, must be diluted to the point where it will not burn. And fire, if it should occur, must be localized and controlled or extinguished.

With a Grinnell Water Spray System, you get protection against all these eventualities.

Before heat raises tank temperatures dangerously, an enveloping spray of water provides instant cooling, reducing internal pressure which helps prevent rupture. In addition, air turbulence is created (even in still air) which, in conjunction with the water vapor from the spray, helps dilute the flammable vapors controlling or extinguishing the fire. Flammable products which cannot be safely extinguished can be burned off under the protecting water spray with no damage to adjacent protected equipment.

There is a Grinnell Fire Protection System for every fire hazard. Call on Grinnell for advice about the one suited to your needs. Grinnell Company, Inc., 277 West Exchange Street, Providence 1, R. I.

GRINNELL FIRE PROTECTION SYSTEMS SINCE 1870



Circle Item No. 173—Reader Service Card

National Safety News, March, 1959

Section 9-Plant Protection

# Now! FULL-POWER Fire Fighting with this complete dry chemical line!



# **Kidde top-rated portables and wheeled units kill more fire...faster!**

From the powerful new 2½-pound portable, on up to the giant 200-pound wheeled unit, Kidde dry chemical extinguishers pack the extra punch needed for stubborn blazes, for full-power fire fighting. Available in pressurized 2½, 5, 10, 20 and 30-pound capacities, Kidde dry chemical portables feature simple, one-two operation, are easiest of all portables to operate, even while wearing gloves. Kidde portables have no valves to turn, no pins to pull, need no bumping or inverting. Just aim, pull trigger, and fire's out! All are quickly and easily pressurized, have dust- and moisture-proof gauges which show at a glance when unit is charged.

The 200-pound Kidde pressurized wheeled unit discharges a 40-foot dry chemical stream faster, has an extra 50 pounds of fire-smothering dry chemical to knock down fire quicker. It's faster and easier to operate... just remove pin, swing toggle lever, and flip on-off lever. Easy to maneuver because of its low center of gravity and larger wheels. Truly a one-man fire engine!

All Kidde extinguishers are granted top rating by Underwriters' Laboratories, are the finest extinguishers on the market today. Get more information about this complete line of full-power fire fighting equipment. Write to Kidde today!



Walter Kidde & Company, Inc. 345 Main St., Belleville 9, N.J.

Walter Kidde & Company of Canada Ltd.

Montreal — Toronto — Vancouver

Reader Service Cond

Circle Item No. 174—Reader Service Card

#### Flammable Liquids

FLAMMABLE LIQUIDS, as defined by the National Fire Protection Association, are those which give off flammable vapors at or below 200 F. They are divided into three classes:

Class 1. Below 20 F. Ethyl ether, acetone, carbon disulfide, gasoline, benzol, collodion.

Class II. 20 to 70 F. Amyl acetate, ethyl alcohol, toluol, ethyl acetate, varnish.

Class III. 70 to 200 F. Stoddard solvents, kerosene, amyl alcohol, creosote oil, turpentine, fuel oil.

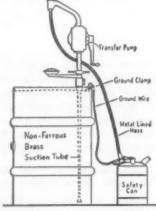
The flash point of a liquid is the lowest temperature at which it gives off enough vapor to form explosive mixtures with air which are capable of propagating flame when ignited.

Portable containers. Safety cans, painted red, with self-closing spouts and flame-arresting screens should be used for Class I and Class II liquids.

If several varieties of liquid are handled in a department, stripes or distinctive lettering should be placed on the can to prevent accidental mixing.

The following labels are recommended:

I. Flash point below 20 F.—Dan-GER! — EXTREMELY FLAMMABLE — Keep away from heat, sparks, and open flame. Keep closed when not in use.



SAFEGUARDS in handling flammable liquids include ground wire with clamps connecting drum and container during filling, metal-lined hose, safety cans, and transfer pumps of approved design. These pumps have flame arresters and protected openings for pressure and vacuum relief.

2. Flash point 20 to 80 F.—WARN-ING! FLAMMABLE—Keep away from heat, sparks and open flame. Keep closed when not in use.

3. Flash point 80 to 150 F.—CAU-TION! COMBUSTIBLE — Keep away from heat and open flame, Keep closed when not in use.

Static electricity. Points of danger are at the outlet of a flammable liquid fill pipe, at a delivery hose nozzle, near an open container, and around a tank truck fill opening or barrel bunghole.

To prevent static sparks during filling, a wire bond should connect storage container and container being filled. The bonding wire or receiving container should be grounded.

Tank cars, storage tanks, tank trucks, connecting pipes, and hose lines and filling nozzles should be interconnected with bonding wire before attempting to open connections during loading or unloading.

When pouring from one container to another, the lip of one container should rest on the edge or lip of the other. The receiving vessel should rest on a grounded surface. The two should be kept in contact during pouring.

Storage tanks above ground, not in contact with moist earth or connected to grounded pipe lines should be grounded. Grounding wire should be uninsulated.

Electrical equipment. For Class I hazardous locations, explosion-proof electrical equipment is specified by the National Electrical Code.

Wiring should be in rigid conduit, with fittings approved for explosive atmospheres.

Transfer pumps of approved design should be used where quantities of flammable liquids are handled. These pumps are self-priming and equipped with flame arresters and protected openings for pressure and vacuum relief.

Combustible gas indicators are available for testing for various gases and vapors including carbon monoxide, hydrogen sulfide, benzol and for oxygen deficiency. An indicator should be used only by an experienced person and the manufacturer's instructions should be followed. \* \* \*



A completely self-contained, independent system with pressurized logarithmic response ionization chamber. Model GA-3B has Mercury battery supply for 4 months continuous operation. Model GA-3BA same as GA-3B but with AC transistorized power supply failsafe to DC. Model GA-3A available in AC power supply only.

#### **RELAY RACK MOUNTING**

The RIGGS four-gang rack unit may be any combination of the above GA-3 series remote area monitoring instruments. A separate power supply is not required. This eliminates the possibility of complete shutdown in event of power supply failure or during maintenance to the monitoring instruments.

The RIGGS system permits service to each individual unit, when necessary, without affecting continuous monitoring by the others.

#### **General Features and Specifications**

Any continuous combination 3-decade logarithmic ranges from .01 mr/hr to 100,000 R/hr.

Energy Dependence Flat to within ±10% from

Flat to within ±10% from 80 Kev. to 2 Mev. Alarm Control System

Meter relays DC, manual or automatic reset. Alarm relay rated 115V AC 5 amps.

Recorder Output 10 mv operated directly from output of unit.

Electronic or Radioactive Calibration Check System Complete circuit check of all ranges both ends of scale.

#### Multiple Channel Area Monitoring System (AMS-II)

This system features a console-type cabinet (19" x 21" x 12"), with provisions for ten radiation channels, a transistor power supply, electronic calibration, an alarm system, optional fail-safe power supply, ionization chamber (hermetically sealed) permits wide temperature and moisture variations, completely submersible. Unit requires no external voltage regulation device. The same radiation specifications apply to this system as our GA-3 instruments.

#### Log Linear Gamma-Beta Portable Survey Meter (GB-1)

Log-linear pressurized ionization chamber portable survey meter. Fast response time 0 to 1 mr/hr linear and two 3 decade ranges from .5 to 500 mr/hr, .5 to 500 R/hr. Mercury battery powered —300 hr. continuous operation, one year intermittent. Allows fast lab monitoring of low level Gamma-Beta radiation with the linear range and incorporates two higher log ranges for general survey work. Energy dependence —flat to within  $\pm 10\%$  from 80 KV to 2 Mev. Other models and ranges available.

Write for free illustrated technical literature and price lists.

Patents Pending.



#### RIGGS NUCLEONICS CORP.

717 North Victory Boulevard, Burbank, California

Circle Item No. 175—Reader Service Card

#### Reserve Water Supply For Fire Fighting

Public water systems are often taken for granted. While their general record is excellent, they are subject to accidents which may suddenly put a plant entirely on its own resources.

Damage from floods, failure of obsolete equipment, freeze-ups and power failures could hamper supply of water. In one case, breakage of a 30-in. supply main, sole link from a reservoir to an industrial city, left plants without protection. Long single mains are particularly vulnerable.

Drought-caused water shortages are a recurring problem in many communities.

Growth of population and increased industrial activity are straining supplies in some communities. While, in most cases, these condi-

tions are remedied quickly, they present a problem which may be accelerated.

Plant water supplies to supplement the public supply are furnished by gravity tanks, by fire pumps taking suction from open bodies of water or from tanks, and occasionally, by private gravity reservoirs.

These supplies must be checked often. Such a check should include levels in tanks and reservoirs, pressures in mains and sprinkler systems, and condition of fire pumps.



Smoking is a problem wherever people are employed, both from the standpoint of fire hazards and time taken off the job. But the habit is widespread and must be considered from the industrial relations angle as well as safety.

Where flammable materials are handled, smoking cannot be permitted. Where no fire or explosion hazard exists, management, supervision and workers can work out details.

Prohibiting smoking is not always effective. Employees may sneak a forbidden smoke, perhaps in a hazardous spot.

A smoking area near the work place, with reasonable time for relaxation, has been the answer in many plants. Supervision is needed to prevent the relaxation from being overdone.

Receptacles for disposing of cigaret butts and pipe ashes should be placed at the entrance to any department where smoking is not allowed. In some hazardous areas employees must check matches and materials as they enter.

Chewing tobacco, while free from fire hazard, is objectionable from cleanliness and hygiene standpoints because of the inevitable accompaniment of spitting. In operations such as food processing, where scrupulous cleanliness must be observed, chewing tobacco is not allowed.

Cuspidors, sometimes a necessary evil, should be provided and cleaned regularly. Disposable cuspidors have obvious advantages in maintaining housekeeping. \* \* \*





# to make your plant SAFER...

Be sure to investigate Conductometer®, the easy-tooperate device for measuring the electrical resistance of flooring, personnel and equipment. A necessity where gases and explosives are used or stored. Helps prevent dangerous and costly explosions. U.L. Listed. Meets N.F.P.A. Requirements. Write for free details now.

As a further step toward greater plant safety inquire about the special conductive floorings and finishes manufactured by our business affiliate, Federal Flooring Corporation.

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FEDERAL FLOORING CORP.
New York 17, N. Y.
82 W. Dodhom \$1.
Botton 18, Mass.

#### How Does Your **Fire Protection Rate?**

Fire Doors. Are self-closing devices in good working order?

Do fire doors close easily and automatically?

Are doors kept clear of stored material and other obstructions?

Are doors and metal coverings in good condition?

Electrical Equipment. Are fuses of correct size applied to all circuits?

Has all temporary wiring been eliminated?

Are light bulbs kept clear of combustible materials?

Are oil switches and circuit breakers in good working condi-

Has dielectric in transformers and switches been checked?

Are electrical grounds and lightning protection satisfactory?

Fire Appliances. Is every fire extinguisher properly charged and tagged?

ENCOURAGE BETTER HOUSEKEEPING by installing BUTT SNUFFER!

Discourage the habit of tossing cigarette butts on floors and into plumbing fixtures.

# SNUFFS OUT Cigars,

Cigarettes, Matches and destroys stale tobacco odors at the

same time. Fire engine red, baked-on enamel finish. Sturdy all steel construction. Comes in two sizes: MODEL #5...8" long, 5½" wide, 6½" high, MODEL #7...14" long, 7" wide, 8" high.

MODEL #5 ... MODEL #7. \$2.95 ea. \$3.95 ea.

F.O.B. shipping point. Send for literature and quantity discounts.

SAFETY FLOOR PRODUCTS 3038 WEST BATH PLACE CHICAGO 17 ILLINOIS

Circle Item No. 178—Reader Service Card National Safety News, March, 1959

Can extinguishers be reached quickly?

Has defective or missing equipment been replaced?

Do outside hydrants drain so as to prevent freezing in winter?

Will all fire hose stand necessary pressures?

If you have a truck, is it ready for immediate use?

Clean Up. Is all dipping equipment cleaned regularly?

Are trash and flammable materials quickly and safely disposed of?

Are metal trash receptacles used? Is excelsior and similar material kept in fire-resistant containers?

Auxiliary Firemen. Are auxiliary firemen well trained? Do they drill often?

Does your fire department maintain regular fire inspections?

Is responsibility for fire protection properly delegated?

Are firemen equipped with all necessary supplies?

Do firemen keep up with the best fire-fighting methods?

Is the public fire department familiar with your plant?

#### Plant Shutdown Ahead? Check These Items

- 1. Remove all waste material from machines, benches, and tables, and oily work clothing from lockers.
- 2. Clean flammable residues from ovens, spray booths, hoods, and ducts.
- 3. Remove solvents, cements, and all flammable liquids to safety
- 4. Disconnect unused gas and electrical equipment, close main valves, and open main switches where possible.
- 5. Check fire extinguishers, fire pumps, hose, and fire-fighting equipment.
- 6. Check water pressure for sprinkler system.
- 7. Check piled stock for obstruction to overhead sprinklers.
- 8. Clean plant thoroughly of all debris, keep aisles clear and open.
- 9. Appoint standby crews or watch service for shutdown pe-
- 10. Notify fire, police, ADT, and other services



# **YOUR LIGHTS COULD FAIL** ANY TIME

But for just pennies a day, you can protect yourself from the risk of sudden darkness. Install Exide Lightguard® emergency lighting units. Completely self-contained, they plug into regular outlets. No wiring required. Then if power fails, Lightguard units go on ... automatically. Flood entire areas with light. Prevent panic, theft, injury, damage. Buy from your nearby dealer. Send for free bulletin.



#### Dry Chemical Effective For Dust Fires

Severe dust conditions cause disastrous fires and explosions in grain elevators, starch plants, candy factories, bakeries, wood-finishing plants and coal-pulverizing locations.

Most materials which burn at a moderate rate when in large particles burn with almost explosive rapidity when finely divided.

Finer particles have a greater surface area in relation to the amount of material in the particle which has to be heated to combustion temperature. When all these surfaces are exposed to air and a spark or other source of ignition is present, rapid combustion builds up high pressure.

If dust is lying dormant on a floor, roof or beam, a smoldering fire often will result. If the extinguishing agent stirs the particles into a dust cloud, an explosion can result. Large losses have been incurred in mills, with most of the damage due to secondary explosions caused by agitation

of dust layers by the first explosion or by extinguishing streams.

Tests conducted by fire protection engineers show the value of an extinguishing agent which will provide a non-combustible opaque coating on combustible dust particles. The agent must be such that, when applied, dust clouds are not formed. Where dust agitation is unavoidable, the extinguishing agent must be able to inert the dust cloud as it is formed.

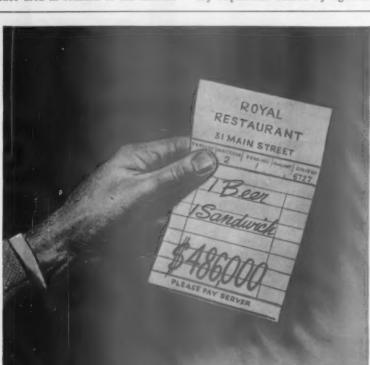
Dry chemical not only does this but also can be used for inerting dusty interiors to reduce explosion hazard. This is done by discharging a dry-chemical extinguisher into the room so the chemical settles over beams, ledges and other places where dust may settle.

Good housekeeping is a must in any location subject to combustible dust conditions. Efficient dust-collecting systems, dust-tight handling equipment and elimination of ledges and other collecting surfaces will do much toward eliminating secondary dust explosions. Explosion-venting windows, hatches, roofs and panels will reduce explosion damage to buildings.

Water extinguishing equipment, where necessary for complete extinguishment of embers, should provide water in a fine spray or fog for gentle application to the dust.

# Safety Applications of Photoelectric Cells

- Protection of machine operators; guards for power presses and similar machines.
- 2. Protection of plant and personnel by detection of:
- a. Flame failure on oil- and gas-burning furnaces.
- b. Poisonous gases; measurement of dust contamination in atmosphere.
- c. Smoke or flame.3. Protection of machinery against
- damage by:a. Switching off power should work become jammed.
- Declutching forging presses when object is below working temperature.
- 4. Alarm devices for protection of property and personnel:
- a. Protection against high-voltage test equipment.
- b. Overrun on cranes.
- c. Height gauge for loaded vehicles.
- d. Burglary and trespassing.



#### Beer and a Sandwich - \$486,000

This is documented fact. An Ohio chemical plant guard had a picnic: he was unsupervised by a watchclock. One night he went to a nearby restaurant for a sandwich and a glass of beer. When he returned he found the building in flames...

Total loss - \$486,000.

For dependable plant protection, it is essential that your watchman is supervised by a DETEX

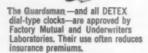
GUARDSMAN Watchclock. Through lonely nights, long weekends and holidays, the tape recording GUARDSMAN will keep him on his toes. Its tamper-proof, embossed record quickly exposes shirkers.

The GUARDSMAN'S extra-capacity tape saves you overtime—makes it unnecessary for a supervisor to return on Saturday and Sunday just to change a 24-hour dial. Write today for complete information, no obligation.





Dept. N-3, 76 Varick Street, New York 13, New York



Circle Item No. 180—Reader Service Card

#### Fire Protection for Windowless Plants

Plants without exterior windows introduce new fire fighting problems, many of which can be avoided by preplanning. Problems are more complicated in multistoried buildings with combustible floors and roofs.

Lack of access and delay in use of hose streams from outdoor hydrants may hamper extinguishment when there are no windows. Another difficulty is lack of available means of smoke ventilation.

Automatic sprinklers will extinguish an ordinary building fire. If the fire is shielded, or if sprinklers happen to be shut off, serious con-

sequences are likely.

Heat and smoke make it difficult to locate and attack a fire. This is further complicated when the lighting system is out of service. If the fire is so severe the building cannot be entered, and if the building has combustible floors and roof, destruction is almost certain.

Air conditioning equipment can

be arranged for smoke ventilation use in case of fire. This is contrary to usual practice for buildings of conventional construction, where air conditioning is shut down at a fire's start, and the area vented by opening doors and windows.

To remove smoke by air conditioning, it is necessary to provide:

- 1. Louvers in outside walls, which will open at low positive pressures.
- 2. Fire dampers in return duct systems arranged for automatic closing by thermostats or photoelectric cells during fire.

Additional exits for personnel and means of access for firemen and hose streams may be necessary.

#### **Metal Fires Need Special Extinguishers**

Ordinary extinguishers are not effective for magnesium, powdered aluminum, zinc, sodium, or potassium fires. For such fires an extinguishing powder, G-1, has been developed. This is available in 40-lb. pails and 325-lb. drums. It is usually applied in a layer at least 11/2 in. deep.

Where large amounts are needed, a wheeled applicator holding 600 lbs. of powder can be used. The powder is discharged by an electric impeller through a hose and nozzle.

#### Smoke Is Deadly

In public buildings and in homes, smoke, hot gases, and toxic fumes take their toll of building occupants and firemen. According to the National Fire Protection Association, some 74 per cent of all dwelling fire victims die upstairs from downstairs fires, asphyxiated by toxic gases.

Worst concentrations of carbon monoxide are usually found in the first stages of a fire, especially in a slow starter. (Two breaths of air containing 2 per cent CO can kill in 3 minutes.)

A smoky fire in a confined place is best left alone. Close the door and call the fire department.

The danger of smoke cannot be judged by its color or density. Thin smoke may be toxic.

Air near the floor may be coolest but it may contain poison gases (such as hydrogen sulfide) which are heavier than air.

CO, even in small amounts, af-



agsoline · kerosene er any flammable liquid!



VENT-A-DRUM automatic



The Vent-A-Drum prevents dangerous explosions which occur from fires and sudden temperature changes when storing flammable liquids, by automatically allowing air to enter or excape container. In addition to protecting property and lives, Vent-A-Drum pays for itself by reducing fuel evaporation 50% Usual Desting firms, approved by Factory Mutual Testing Laboratories. Precision-engineered, never requiring adjustment or replacement of parts. Cast Branzo. Completely guaranteed.

Dealerships and literature available.

CENTRAL DE 6613 MARSDEN ST. PHILA. 35, PA Circle Item No. 182—Reader Service Card PHILA. 35, PA.

#### LIGHT WARDEN

chargematic emergency lighting



See All These New Models in the 8 Page, 1959, Catalogue.

- MODEL SOWNC WITH NICKEL CADMIUM BATTERY, UNDER \$100.00
- . MODEL 400 WITH LEAD CALCIUM
- MODEL 300 WEATHERPROOF FOR OUTDOOR APPLICATIONS
- 2 NEW DRY BATTERY OPERATED UNITS

. 8 PAGES OF EMERGENCY LIGHT-EQUIPMENT AND ACCES-SORIES

Send for Your Free Copy Today **ELECTRIC CORD COMPANY** 21 Spruce St. New York 38, N. Y.



Designed for:

Dangerous Entrances and Exits

· Hazardous Locations · Traveling Cranes Moving Machinery
 Disaster Warnings

No one can miss this signal! Covers 360° like an airfield beacon . . . with a powerful red flash every second! Heavily constructed. Beautifully finished in vitreous enamel to last indefinitely . . . corrosion proof! TROUBLE FREE synchronous motor 115/130 V., A.C. Standard 75 W. Bulb easily replaceable. Maintenance and upkeep negligible.

WRITE TODAY! Get the Facts

TRIPPE MFG. CO., Dept. E-2 133 N. Jefferson St., Chicago 6, III.

Circle Item No. 181-Reader Service Card National Safety News, March, 1959

Circle Item No. 184-Reader Service Card



fects a person's reasoning. Anyone who has been through a fire, therefore, should be watched. Persons having escaped from a burning building have been known to run

Application of resuscitation and oxygen inhalation has saved many victims of asphyxiation. \* \* \*

#### Six Steps in Fire Protection

1. When building a plant or making additions, submit tentative plans to your insurance agent. He can secure rating credit information.

2. Plan a program of fire protection—including equipment, training, and fire resistive construction, where practicable.

3. Sell management on a fire safety program.

4. Provide fire safety information to all employees.

5. Have a complete inspection of premises every quarter by a fire protection engineer or representative of the fire department.

6. Ask your insurance safety engineer to check fire exposures while making surveys.

#### TOKHEIM High-Vacuum

#### HAND PUMPS

for industrial liquids



housekeeping, preventing waste. Eliminates slippery floors and liquid accumulation so often the cause of fire and accidents. Delivers 20 gallons per 100 back and forth strokes. Pumps oil and many other liquids. (Write for approved list.) Has hose or spout outlet. Call your dealer, your Tokheim representative, or write factory.

General Products Division

TOKHEIM CORPORATION DESIGNERS AND BUILDERS OF SUPERIOR EQUIPMENT Fort Wayne 1, Ind. 1470 Wabash Ave.

OKHEIM

Subsidiaries: Tokheim N.V., Leiden, Holland — GenPro, Inc., Shelbyville, Ind. Factory Branch: 475 Ninth Street, San Francisco 3, California In Canada Tokheim-Reeder of Canada, Itd., 205 Yonge St., Toronto, Ont. Circle Item No. 185-Reader Service Card

#### WARNING LIGHTS!



POWERFUL REVOLVING FLASHING TYPES

FOR INDUSTRIAL USE AND

**EMERGENCY VEHICLES** 

PERMANENT MOUNTING AND DEMOUNTABLE TYPES

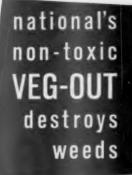
ALSO AUTOMATIC EMERGENCY LIGHTS, PORTABLE SEARCH & FLOODLIGHTS AND SIRENS



THE PORTABLE LIGHT CO., Inc.

Write for FREE Literature-Dept. 70

Circle Item No. 186-Reader Service Card National Safety News, March, 1959





National's non-toxic VEG-OUT is a nonselective weed killerit will attack all vegetation, Liquid VEG-OUT is safe to use around humans or animals. Sprayed on the surface of the earth, it is carried into the soil by rain or water and absorbed by the roots of growing or dormant vegetation. The roots die and the entire plant is permanently destroyed. VEG-OUT can be applied by hand or mechanical sprayer at any season of the year. Use VEG-OUT to rid your soil of undesirable vegetation.



#### national

DISINFECTANT COMPANY 2417 Commerce, Dallas 906 S. Seventh, St. Louis

Circle Item No. 187—Reader Service Card National Safety News, March, 1959

#### **Placing Extinguishers**

An extinguisher may be useless if an employee must spend valuable minutes looking for it, or if it is blocked by piles of materials.

Here are 6 recommended rules:

- Locate extinguishers close to fire hazards but not in the fire zone should fire occur.
- Place extinguishers so access will not be blocked by fire.
- Install enough extinguishers to deal with any expected blaze, considering the rapidity with which it might spread, intensity of heat, etc.
- 4. Mark locations conspicuously.
- Identify each unit for the type of fire it is designed to combat.
- Protect extinguishers from traffic.

Marking locations. Contrasting backgrounds make extinguishers conspicuous and less likely to be overlooked in the excitement of a fire. Here are 4 methods:

- Paint a large red or white background on the wall.
- Paint a large red spot on the floor under the extinguisher.
- Paint vertical red bands with yellow borders down a wall or column where equipment is placed.
- Provide lights of distinctive color which do not conflict with exit lamps, \* \* \*

#### Fire Protection for Industrial Trucks

Industrial trucks—ram, fork or crane—can be powered by gasoline engines, liquefied-petroleum gas, gasoline-electric power units, or storage batteries. These power plants require certain precautions to avoid fire hazards.

Each truck should be equipped with a 2½-lb. carbon-dioxide extinguisher; a 4-lb. gas-pressured drychemical extinguisher, or a 1-qt. vaporizing-liquid extinguisher. These are the smallest sizes approved for industrial use.

Refuel gasoline trucks in a safe location away from storage and manufacturing areas—preferably outdoors. Shut off the engine during refueling and avoid spilling fuel or overflowing the tank.

Collisions may damage fire-protection equipment. Lift trucks have been known to break sprinkler pipes, causing heavy damage to stock.

# SYNONYMOUS WITH SAFETY COMBUSTIBLE GAS INDICATORS AND ALARMS

For testing selected danger areas, J-W portable instruments give dependable, troublefree service at low cost.



J-W Model & Portable Indicator—for easy spot checking of confined and inaccessible spaces. Bettery-operated. Soft aspirator bull billows almost effortless sample drawing. Weighs slightly over 4 lbs. Automatically switches on and off with appropriate movement of aspira-



J-W Sentinel Portable, Audible Alarm — for continuous "watchdog" protection around any bazardous activity, indeers and out.

Indicates quantity of combustible gas build-up and loudly warns of dangerous concentration around such operations as welding and electrical repair, and when cleaning and repairing tanks and tines. Ruggedly built for versatile



For detailed data as these models and J-W instruments for fixed installation, contact the makers of tap quality woolurts for now 25 wears:

JOHNSON-WILLIAMS, INC. Palo Alto 9, California

Canadian customers, please write: SAFETY SUPPLY CO. FLECK BROS. LTD. TORONTO, UNT. VANCOUVER, R. C.

Circle Item No. 188-Reader Service Card

# aster ADLOCKS

#### FOR PERSONNEL AND PROPERTY PROTECTION!

- Switch Boxes
- · Tool Storage
- Classified Areas
- · Gates
- Explosives
- Chemicals

#### **Famous Master** Laminated Padlocks

steel plates stronger than a solid block! Genuine breas-cylinder, pla-tumbler security. No finer podlock prote-tion.

#### Stainless Steel Combination **Padlocks**



#### Special Long or **Short Shackles**

switch boxes chains, truck or freight car doors, and other uses where special shackle lengths are other re special le lengths are desirable.



taster's Service De-artment is geared for ast delivery . . . in mergencies, special reders are on the way rithin hours!



Write for FREE catalog

Master Padlocks

Master Lock Company, Milwaukee 45, Wis. World's Largest Padlock Manufacturers Circle Hem No. 189-Reader Service Card 240

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Nuclear Sentries Never Nap; Oct. 1957. How Wet Water Fights Fire; Nov. 1957. Radioactivity—a Challenge to the Fire Department; Andrew A. Keil, Nov. 1957.

"Lighting-Off" Explosions; J. B. Smith, June 1958.

Integration Can Help Fire Protection; Allen L. Cobb, July 1958. Fire Problem Licked by Lederle; Oct. 1958.

#### National Fire Protection Assn.

National Fire Codes, 1958:

Vol. 1. Flammable Liquids and Gases. Vol. 2. Combustible Solids, Dusts, Chemicals and Explosives.

Vol. 3. Building Construction.
Vol. 4. Extinguishing Equipment.

Vol. 5. Electrical.

Vol. 6. Transportation and Miscella-

NFPA Handbook of Fire Protection (Crosby-Fiske-Forster) 1954.

(A complete list of NFPA publications may be obtained from the Association.)

#### National Board of Fire Underwriters

Numerous pamphlets on specific phases of fire protection.

#### **Equipment Lists**

Associated Factory Mutual Insurance Companies

Approved Equipment for Industrial Fire Protection. Underwriters' Laboratories:

Fire Protection Equipment List. Electrical Appliance and Utilization List

Hazardous Location Equipment List.

Shuts Doors, Windows, Stops Conveyors, Sounds Alarm....



#### **EXTINGUISHING SYSTEMS**

Where fire hazards are severe and access limited . . . play safe! Be ready and secure with a fast action Randolph Automatic Fire Extinguishing SYSTEM!

Write today for Randolph's free FIRE HAZARD INDEX listing equipment safeguards for 580 typical fire hazards. Randolph Laboratories, Inc., 1455 Frontage Road, Northbrook, Illinois



Doors and windows close, conveyors stap...



CYCLONE" nozzles flood entire room CO2 in 15 seconds.



Circle Item No. 190-Reader Service Card

National Safety News, March, 1959

# MEDICAL AND HEALTH SERVICE

#### IN SECTION 10:

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INDUSTRIAL MEDICINE provides "preventive maintenance" for the people who carry on so much of the world's essential work. It has gone far beyond its original function of patching up industry's casualties, although that service will always be invaluable.

Keeping the workplace safe and hygienic calls for both medical and engineering knowledge. This has become increasingly important and difficult as new materials and processes involving known and suspected health hazards have been introduced.

Medical departments have achieved a high degree of control over these hazards through examination, placement, and health supervision over the individual worker and through supervision of manufacturing processes.



#### brings to the Unit System

#### this advanced principle of wound dressing



#### "the mercy dressing" that won't pull off the scab

Now you can provide your workers this improved nonadherent dressing that doesn't hurt when you take it off. Available in a wide variety of MSco field first aid units including 1-inch plastic adhesives shown above . . . the longest made (3\%") to provide full, proper overlap on the well-developed fingers and knuckles of industrial workers. MSco brings you TELFA\* PAD extra features at no extra cost over plastic adhesives with an ordinary pad.

WHAT IT IS... TELFA is an entirely new type nonadherent dressing for all wounds. It consists of a nonwettable, perforated plastic film firmly bonded to a highly absorbent material.

**HOW IT WORKS...** Wound drainage is absorbed through perforations in the plastic film (which is placed next to the wound) by the virtual pumping action of highly absorbent backing.

**TELFA** allows wound to drain, but doesn't stick to the scab like an ordinary gauze pad. It is "the mercy dressing" that leading hospitals have adopted to prevent damage and scarring to healing skin tissue . . . speeds wound recovery!

NOW AVAILABLE IN THESE MSco UNITS... No. 100ACT 1-inch Adhesive Plastic Bandage; No. 211A 2-inch Bandage Compress; No. 212A 3-inch Bandage Compress; No. 213A 4-inch Bandage Compress.

OUCH! Old-style bandage with gauze pad is stuck to wound causing it to bleed. So wound has to heal all over again.



SMOOTH! Bandage with TELFA PAD doesn't ever stick to wound. Scab stays put, wound stays healed!

\*Trademark of The Kendall Company

Specialists aid in first aid

242



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#### **Medical Supply Company**

Rockford, Illinois

CAMESCO Medical Supplies Ltd., Toronto, Canada



## **Medical and Health Service**

#### Preventive maintenance for people

HEALTH MAINTENANCE for employees, through the prevention as well as the treatment of both disease and accidents, is the goal of industrial medicine. The medical department plays a major part in accomplishing this through:

1. Supervision of processes and the working environment to provide safe and healthful working conditions.

Services for the treatment of the ill or injured.

3. Supervision of the health status of the individual through examination, counseling, and placement.

4. Health education.

New processes and materials with actual or potential health hazards have brought additional problems to the medical department. To study hazards and devise protective measures for those who manufacture the products and those who use them, some large corporations maintain industrial hygiene laboratories.

Smaller companies obtain help on medical and health problems from insurance companies, state departments, laboratories maintained by universities and research organizations, and from consulting industrial hygienists.

#### Scope of Medical Program

Industrial medical service requires an organized plan. It must have management's full support but the program director should be given considerable latitude in carrying out his methods and policies.

Essentials of the program are:

1. A staff of qualified physicians, nurses and attendants.

2. Dispensary and hospital facilities conforming to standards established by the American Medical Association, American College of Surgeons, and the Industrial Medical Association.

3. Efficient care of occupational injuries and diseases.

 Reasonable first-aid treatment for nonoccupational injuries and illnesses while on the job.

Physical examinations—pre-employment and periodic.

 Adequate records of treatments and individual medical histories. (The latter should be kept confidential.) 7. Supervision of plant sanitation and hygiene measures.

8. Instruction of employees in personal health and safety.

Industrial medicine recognizes the place of the private practitioner in providing medical care for the employee and his family. It avoids competition where community medical resources are adequate.

Hospitals. Use of approved public hospitals, where available, is usually more desirable than setting up elaborate facilities for surgery and treatment of serious cases.

#### The Staff

The Medical Director. Health and medical services should be under the supervision of a physician. Management and the medical director can formulate workable policies.

Medical assistants, consultants, nurses, and others should be selected on the recommendations of the medical director.

A full-time physician may be warranted by size of the plant or nature of its operations. Sometimes a plant physician engages in private practice with the company's approval. He may devote part of his

time to the industrial organization, assuming supervisory responsibility and delegating detail work to qualified assistants.

The Nurse. Most industrial nurses are employed by companies which have single-nurse dispensaries and a part-time physician. The nurse is assistant to the physician and his representative when he is not at the plant. She is also friend and confident of the employees.

Where the nurse is the only fulltime person in the dispensary, her

duties include:

1. Maintaining supplies and equipment.

Providing first-aid care for injuries and emergency treatment of illnesses as authorized by the physician in charge.

Assisting the physician with medical examinations.

4. Participating in the health and safety program.

 Promoting health education and counseling employees on personalhealth problems.

Taking part in welfare activities.
 Keeping adequate dispensary records. Paper work should not be permitted to interfere with professional duties.



DISPENSARY with reception room and treatment booths. Acoustic ceilings reduce noise. Walls painted in pleasing colors and floors of resilient tile are easy to keep clean. (Diamond Alkali Co.)

#### Section 10-Medical and Health Service

8. Being familiar with the plant and its hazards through plant tours.

The health program may require the services of other specialists, such as industrial hygienists, safety engineers, and sanitary engineers.

Cooperative Services. Where several small plants are close together a cooperative medical service program can often be maintained. A central dispensary with necessary personnel and equipment is maintained. Adequate service can be provided at moderate cost.

#### **Physical Examinations**

Pre-placement examinations are standard procedure in many companies. Their purpose is to place each employee in a job suited to his capacity rather than to bar anyone from a job.

Periodic checkups are desirable, particularly for elderly employees, for those in jobs where safety depends on physical fitness, and where there is exposure to health-hazardous materials.

Examinations include vision, heart, chest, blood pressure, hearing, and urinalysis. Tests in some industries require elaborate laboratory facilities and highly trained personnel.

Laboratories. For most industries, facilities for taking urine tests and blood counts are needed. Blood serum samples can be sent to a laboratory for analysis. Where a large volume of toxicological tests is conducted, a plant laboratory may be desirable.

Vision. Several devices for testing visual acuity and classifying workers for jobs are available. These devices can be used by trained laymen. Employees showing visual defects are referred to ophthalmologists or optometrists for further tests.

Hearing. By means of the audiometer, acuteness of hearing can be determined and any necessary treatment indicated. Progressive loss of hearing, through noisy work or other causes, can be measured.

Chest. For many occupations, pre-employment and periodic examinations include chest x-rays. Mass chest surveys are made at regular intervals in industries where health hazards require frequent

-To page 250

# Care of the Injured

ACCIDENTS and sudden illness may occur wherever people work, travel or play. First-aid facilities that meet at least minimum standards should be available. Equally necessary is the trained person who knows what to do, and what not to do, in an emergency.

Prompt, skilled treatment has prevented many minor injuries from becoming serious. Sudden attacks of illness may occur anywhere, and the layman who can administer emergency treatment and get the patient to a physician can often prevent serious consequences.

A physician or nurse should treat injuries wherever possible. Companies which have trained large numbers of first aiders do not permit them to treat injured persons if medical service is available. Their training is strictly for emergencies.

Most injury cases, however, both on the job and outside, are first handled by laymen. The minutes before the doctor arrives may be vital. Many a life has been saved because some person checked bleeding, treated shock, or applied artificial respiration.

Many laymen acquired skill in first aid during military service and demonstrated the value of their training in combat. Many civilians have been trained by the American Red Cross and the Bureau of Mines in the United States, the St. John's Ambulance Association in the British Commonwealth, and by similar organizations in other countries.

Adequate care of the injured requires:

- 1. Trained attendants.
- 2. Clean, convenient quarters.
- 3. Equipment and supplies that meet medical standards.
- Well-planned organization and procedure.
  - Well-kept records.

This discussion is concerned primarily with plants which must depend on trained laymen, or at most a full-time nurse and part-time physician rather than those with medical staffs and hospital facilities.

The Staff. First-aid facilities should be under supervision of at least a part-time physician. A full-time registered nurse is desirable, even in a medium-sized plant.

If a full-time nurse is not practicable, at least two employees who have completed standard first-aid courses should be selected to carry on the work. They should be under supervision of a doctor or nurse.

Attendants should be allowed sufficient time from their jobs to maintain the first-aid room, check supplies and keep necessary records. An attendant, should be available during working hours.

#### The Dispensary

A separate room should be provided, if possible. Patients should have reasonable privacy. If it is not practicable to partition the dispensary into a waiting room and a treatment room, a screen can be used.

The first-aid room should have:

- 1. Good lighting.
- Adequate ventilation and comfortable temperatures.
- 3. Lavatory with hot and cold running water.
  - 4. Quiet location.
- Floors of durable and easily cleaned material.
  - 6. Toilet facilities.

The first-aid room should be quiet, well ventilated and away from doors. Windows should be screened to keep out insects.

Furnishings should be simple and neat. The color scheme has an important influence on the patient. Walls painted with semi-gloss enamel in light tints of green, cream or buff are cheerful and easy to keep clean. "Hospital white" is no longer favored.

A patient who is nervous or in a state of shock may be upset still more by intricate patterns on walls and ceilings.

The floor should be resilient and easy to clean. Linoleum, rubber tile, vinyl tile, and asphalt tile are practical for dispensary use. A sweeping compound, a vacuum cleaner with brush attachments, and damp or chemically treated cloths for dusting help to keep down dust.

**Equipment.** For a dispensary with a registered nurse in charge under the supervision of a part-time physician, equipment might include:

- 1. Two white enameled chairs and a bench.
- 2. Enameled top table or desk.
- 3. Stool.
- 4. One or more beds or cots.
- 5. Linen and blankets.
- 6. Waste can with cover.
- 7. File for medical records.
- 8. Floor lamp.
- Treatment table and instrument cabinet.
- 10. Medicine chest.
- 11. Small sterilizer.
- 12. Small items of office and surgical equipment, such as basins, pitchers, rubber gloves (sterile), scissors, tweezers, forceps, hot-water bottle or electric heating pad, ice bag.
- 13. Stretcher.
- 14. Telephone.

#### First-Aid Kits

If the dispensary is staffed by nonmedical personnel, keep the setup as simple as possible.

The supervising physician should be consulted about selection of materials, particularly when medication is involved. He should select such items as first-aid antiseptics and burn dressings.

Unit first-aid material is replacing bulk supplies for smaller plants, for small groups detached from a central headquarters, men working in isolated areas where medical help is not available, and on trains, buses, trucks, and airplanes.

Unit first-aid material is desirable because each dressing and treatment is an individual unit, for one-time use only. Materials can be kept sanitary for long periods. There is more likely to be a sufficient quantity and wider assortment of bandages.

To simplify maintenance of industrial first-aid kits and to establish commercial standards for sizes of unit cartons and kits, the Division of Simplified Practice, National Bureau of Standards, has compiled Code R178-41 in cooperation with industry.

Kit sizes and their contents are determined by the number of persons to be protected, with consideration to the nature and frequency of injuries likely to occur. Kits come in 10-, 16-, 24- and 36-unit sizes. A 24-unit kit, for example, would be suitable for a group of 50 men.

Specifications outlined in Federal Specification GGK-391 (Amended) are generally accepted and used



MECHANICAL RESUSCITATION plus oxygen inhalation can save many a life when breathing is suspended. Such apparatus is invaluable when multiple casualties tax the capacity of trained personnel. (Linden Industrial Mutual Aid Council.)

by manufacturers in the production of unit first-aid material and kits.

For operations under federal regulation, assortments have been specified although these may not fit all local requirements. Contents of kits include:

Adhesive bandages
Burn compound
Burn solution
Petroleum gauze
Ammonia inhalants
Antiseptic swabs
Antiseptic applicators
Tincture green soap
Eye packets

Bandage compresses—2-, 3-, 4-in. Tourniquet

Forceps Scissors

Triangular bandages

Gauze pads Gauze bandages

Gauze compress Adhesive tape

Aspirin or other analgesic Sodium bicarbonate tablets

Poison ivy ointment

Insect repellent

If poisonous snakes are likely to be encountered, a snake-bite kit should be included.

The unit system does away with many of the objections to first-aid kits, but a competent and conscientious employee should be responsible for dispensing supplies. Employees may help themselves, often for home use, and supplies may not be replaced. Also, self-treatment should be discouraged.

For the smaller plant, ideal quarters for a first-aid station may not be available but the best possible spot should be chosen. It should be readily accessible to the working zone and convenient for supervision and maintenance.

Hot and cold running water and toilet facilities are desirable for the small plant. Privacy is also important and a screen will do if a separate room is not available.

Equipment may be selected from lists suggested for dispensaries, keeping in mind limitations of space and requirements of the plant. The following are essential:

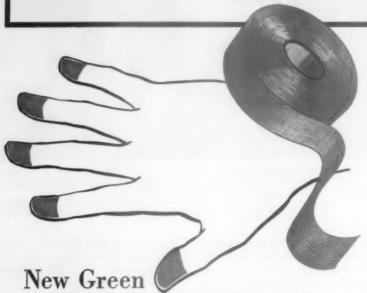
- Desk or table for filling out reports and records.
- 2. Chair or stool.
- 3. Filing cabinet for records.
- 4. Waste can with cover.
- 5. Bulletin board.
- 6. First-aid manual.

#### Dispensary Records

Accurate records should be kept of treatments. If injuries are infrequent, a small day book may be sufficient, if kept systematically. Entries should include these details:

1. Date and time of injury.

# New "Safety-Colored" Protection against **Accident Losses**



# GUARDTEX

self-adhering

#### SAFETY TAPE

- · Helps protect fingers, hands, forearms against cuts, burns and abrasions. Reduces eye strain.
- Promotes safety in many operations where potential hazards exist-transformer lamination, pig-tailing, handling hot or sharp glass, sanding, polishing, machining, buffing, burring, grinding, punch press operation.
- Self-adhering, easy to apply and remove. Conforms neatly to finger contours, without affecting "feel" or flexibility. Ideal for use in working with delicate finishes such as making mirrors since GUARDTEX leaves no sticky residue, color stain, or fingerprints.

CUT YOUR ACCIDENT RATE, SPEED YOUR PRODUCTION WITH **NEW GREEN GUARDTEX** Self-Adhering SAFETY TAPE

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- 2. Date and time injury was reported for treatment.
  - 3. Name of injured.
  - Address of injured.
  - 5. Where and how injury was received.
  - 6. Names, addresses, and telephone numbers of witnesses.
  - Nature of injury.
  - 8. Kind of treatment given, and by whom.
  - 9. Did employee return to work after treatment? If not, when?

#### **First-Aid Antiseptics**

Infection of an open wound can be prevented by killing germs already present or by removing them mechanically and preventing entrance of more. It is in this second theory that soap and sterile water are used in aseptic treatment of wounds.

Thorough washing with soap will mechanically remove organisms and a sterile bandage will prevent entrance of more. Few are destroyed in the process by ordinary soaps.

Germicidal Soaps. Germicides, including phenol and mercury compounds, have been used in soaps but their effectiveness requires too high a concentration for ordinary use. But good results have been reported from hexachlorophene for general as well as surgical use.

Many substances will kill germs in a test tube but a first-aid antiseptic must kill them in the presence of body substances and not kill too many body cells at the same time.

#### References—Care of Injured

#### National Safety Council

Unit First-Aid Kits, Data Sheet D-202. Emergency Nursing Care of the Eyes; Safety Reprint Gen. 4. Pole-Top Resuscitation; Data Sheet D-376.

Snake Bite Manual

#### National Safety News

Treatment of Low-Voltage Injuries; Henry S. Brown, M.D., June 1953.

Basic Requirements for First Aid; Jan.

First Aid for Field and Small Plant; R. P. Whitney, May 1955.
Turning Back Death; W. A. Mathews,
June 1955.

Patching Up Some Industrial By-Prod-

ucts; W. B. McCunniff, M.D., Feb. 1956. Is Your Plant Immune to Asphyxia? John B. Dunne, Nov. 1957.

Respiratory Emergencies; Esther Myers Stephenson, Jan. 1958.

Life or Death on a Pole Top; Oct. 1958. Life-Saving Oxygen; William E. Doering,

If You Can't Avoid Snakes; May 1958.

National Safety News, March, 1959

The choice should be left to the doctor in charge.

Mercury bichloride, for instance, is effective but injurious to tissues. Compounds such as merthiolate, merphenyl, and mercurochrome are devised to get the antiseptic properties of mercury without its toxic effects.

The halogens (tincture of iodine and Dakin's solution) have been widely used because of their strong oxidizing action. They are even stronger than hydrogen peroxide, which is used for the same reason.

Antibiotics. Sulfa compounds, penicillin, terramycin, etc., are not antiseptics, though they are useful in treating infections. They should be used only under medical supervision.

Transporting the Injured

Where there is any doubt about moving the patient, medical aid should be brought to the scene of the accident, if possible. Lifting a patient into a car may aggravate injuries.

Before the patient is moved he should be treated for possible shock. Fractures should always be splinted.

Stretchers. The army type is easy to handle. It can be used as a cot at the scene of the accident, in transit, and at the first-aid room or hospital. It is frequently stored in a canister in a conspicuously marked spot to keep it clean and ready for use.

Collapsible stretchers may be folded when not in use and carried in an automobile. Some are equipped with wheels and an adjustable head

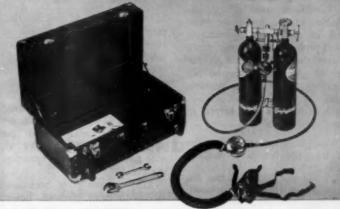
Bandages, splints, and stretchers may be improvised in emergencies when regular equipment is not available. Improvisation is part of firstaid training. Where men are at work, however, approved equipment and supplies should be kept on hand.

**First-Aid Training** 

It is often found that accidents are less frequent among persons trained in first aid and it is advisable to have as many employees as possible receive this training.

The American Red Cross first-aid textbook and the U.S. Bureau of Mines manual of first-aid instruction are recommended textbooks.

# Reduce Lost Time Accidents, **Cut Disability and Improve** Morale, with a **Scott Demand Inhalator**



#### Indispensable to your Dispensary





In heart and asthma cases - for victims overcome by smoke, fumes and gases - for accident shock victims, you may speed recovery if your first aid equipment includes a Scott Demand

Oxygen treatment administered quickly can be of tremendous importance. Scott Demand Inhalators can be put into operation in seconds. No adjustments of pressure or flow are required. Safe and easy to use. Special training is not necessary. Oxygen flows at rate and volume required by patient, and when needed - the added help of slight positive pressure, with the touch of a button.

Take steps now to be ready for that next victim. Let us send you complete information. Write us today or contact your nearest Scott Distributor.

> If there is Breathing Difficulty -GIVE OXYGEN



MEDICAL DIVISION

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Circle Item No. 193-Reader Service Card

#### Resuscitation

#### **Methods and Equipment**

PROMPT APPLICATION of some kind of artificial respiration has aided in the recovery of many thousands of people suffering apparent asphyxia. Artificial respiration is of no value when body conditions do not permit life. However, these conditions usually are undetectable except by those well trained in diagnostic procedures; thus it is probably best to start some maneuver that will permit an exchange of gases in those who are unconscious at the earliest possible moment.

Artificial respiration is helpful in the following cases:

1. When air is excluded from the lungs, e.g., near-drowning, choking, strangling, etc.

When exposed to gases that displace oxygen in the circulating blood, e.g., carbon monoxide poisoning.

3. When exposed to low concentration of oxygen for brief or long

periods, e.g., silos, wells, vats, noxious fumes, etc.

 When the respiratory system is depressed or paralyzed, e.g., electric shock, alcoholic intoxication, overdoses of certain drugs, etc.

Methods of artificial respiration may be classified as:

- 1. Manual
- Mouth-to-mouth, mouth-to-airway or mask.
- 3. Mechanical devices

Manual methods are classified as single phase or dual phase maneuvers. Single phase maneuvers rely solely on either compression of the chest to cause an expiratory gasp without any active effort to provide an inspiratory gasp or the opposite, that is, expansion and relaxation of the chest. Two phase maneuvers, or those commonly called "pushpull" methods, provide for alternate compression and expansion of the chest.

Many names have been associated with these methods, however, it is probably best to give the names which describe the motions, e. g.,

back pressure-arm lift (prone), back pressure-hip lift (prone), chest pressure-arm lift (supine).

All artificial respiration methods are ineffective or of questionable value if the rescuer (s) are not able to obtain and maintain an open airway. By the same token, all probably are effective if a clear airway can be assured.

Breathing directly into the asphyxiated person with mouth-to-mouth contact, through an artificial airway or into a mask using your own expired air, is another common form of resuscitation. Here again the techniques will be effective only if a clear airway is assured.

The last form of resuscitation referred to is providing movement of air in the asphyxiated by devices which feed oxygen or oxygen and other combinations of gases. These are generally classified as inhalators, intermittent positive pressure devices and resuscitators (suck and blow devices).

#### **Equipment**

The inhalator is defined as a "mechanism providing continuous low pressure." Inhalators must be used in combination with some form of artificial respiration if the victim is totally asphyxiated. Inhalators are of value when the subject is capable of breathing effort, and requires oxygen above that normally in the air, for brief periods.

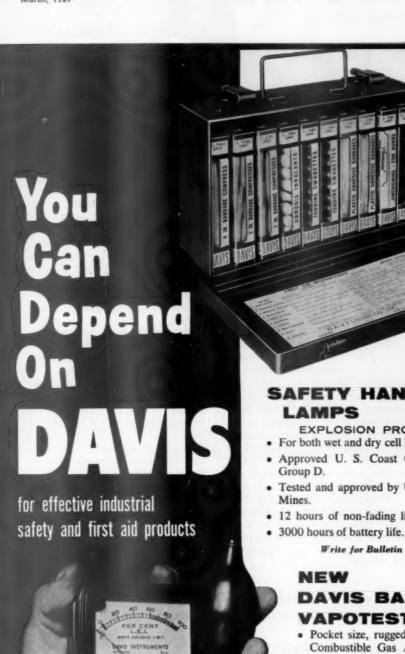
Intermittent positive pressure devices are defined as "mechanisms providing oxygen or other gas combinations under pressure for the inspiratory phase." The mechanism then shuts off and the expiratory phase is passive.

The resuscitator is defined as a "mechanism which provides alternate, positive, and negative pressures and feeds oxygen or other gas combinations."

For first-aid purposes it is now the consensus that all of these devices should provide oxygen and not add other gases. When devices similar to these are used in hospitals, combinations of gases are used but since in most cases the primary function of artificial respiration is to raise the blood oxygen saturation and lower carbon dioxide tension, first-aid trained personnel should



CAMBRIDGE 40, MASS.



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- · Each unit cellophane-wrapped with easy -opening tab.
- A break in the continuous red line signals when unit has been opened.
- Quick inspection window permits the checking of contents of units without removal from kit.

Write for Bulletin 334

EXPLOSION PROOF

- For both wet and dry cell lights.
- Approved U. S. Coast Guard Class 1,
- Tested and approved by U. S. Bureau of
- 12 hours of non-fading light per charge.

Write for Bulletin KOH

#### DAVIS BANTAM VAPOTESTER

- · Pocket size, rugged, light-weight, Combustible Gas Analyzer.
- · Convenient to use, easy to operate, in the palm of your hand, or in case as shown.
- · Self-contained for 40 hours of operation.

Plus - the Bantam has all of these additional **NEW FEATURES** 

- One knob turns "ON", and adjusts the meter.
- · Pilot light indicates "ON", and illuminates dial.
- Meter incorporates a 2½" easy-to-read scale.
- The sample hose and aspirator bulb plug into either side of the instrument for right or left hand use.
- The compact leather case holds the aspirator bulb,
   5-foot sampling hose, with short probe, spare battery,
   and a screw driver. Spare filament included.
- Not affected by vapors of tetraethyl lead gasoline.

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Instrument with case and all accessories: (Weight 334 pounds) (4" x 6" x 5")

Instrument less case: (Weight 2 pounds) (3" x 534" x 244",

DIVISION

VAPOTESTER

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Circle Item No. 196-Reader Service Card

# A NEW DIMENSION IN FIRST AID TRAINING

INJURY MOULAGES



The student of first aid can never plan the time and place when he must first practice what he has learned.

This situation led to the development of Injury Moulages, which have the appearance of real injury both in form and color. They faithfully reproduce bleeding and respond to first aid as do actual injuries. Stoppage of bleeding and the application of bandages, splints, dressings, etc., can be taught in realistic situations.

Alderson Research Laboratories, Inc.

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# FIRST AID KITS WITH A PURPOSE



Every one of the over 100 HALCO First Ald Kits was designed to include a maximum of vital First Aid medications. Whether a plant employs 2 or 502, there's a HALCO Kit ideal for every use. Write for complete data and the name and address of the nearest HALCO Dealer.

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YOUR SAFETY-OUR BUSINESS

Circle Item No. 197-Reader Service Card

use equipment that feeds only oxygen.

Another technique for giving artificial respiration which is considered neither manual nor mechanical should be mentioned. This technique requires the use of a tilting board-a stretcher-like device resting on a "sawhorse" type frame. The asphyxiated person is strapped, usually in a prone position, to the stretcher and first placed in a headdown position and then tilted to a feet-down position using an alternate action which would be normally about 12 cycles per minute. Certain of these devices have attachments to feed oxygen during the tilting maneuvers.

People who use mechanical devices for resuscitation purposes should be thoroughly trained in the operation of that particular machine. The machine should be checked out regularly with the same thoroughness as fire-fighting equipment. The most important aspect of the operation of mechanical devices is the same as in the case of manual methods—the ability to obtain and maintain a clear airway.

The pharynx of all asphyxiated persons should be checked frequently to make sure there is no interference as a result of evacuation of stomach contents or accumulation of mucus.

This article has been prepared for NATIONAL SAFETY News by The American National Red Cross.

#### **Medical Service**

-From page 244

checks, and in public health campaigns to detect incipient cases of tuberculosis and cancer.

Trained technicians with mobile equipment can be engaged to conduct mass x-ray surveys.

#### Consultants

The medical director, like the private practitioner, is not an expert in all branches of medical science. Both find it necessary at times to call on specialists when diagnosis is uncertain or treatment requires specialized techniques.

Surgeons. In all surgical cases where there is danger of inaccurate

diagnosis or inadequate treatment, an outside consultant should be called promptly. Frequently, the administrative and diagnostic ability of the medical director is more important than skill in surgery. The plant physician should refer all cases which might be beyond his training and experience to a specialist or surgeon.

Oculists. One of the most frequent occupational injuries is to the eyes. The importance of one's eyesight justifies obtaining the highest available skill. Specialists should be summoned in all potentially serious cases.

Ophthalmologists and optometrists also can serve industry in correcting defective vision among employees. The employee should, of course, have the privilege of choosing his own refractionist, but frequently he will ask advice of the medical department on selection of a specialist.

Where prescription goggles are indicated, some companies provide the examination.

**Dentists.** Injuries to the teeth are relatively infrequent in industry. Such cases usually are sent outside for treatment. The medical department should have a list of dentists qualified to treat such injuries.

The importance of oral hygiene has led many companies to provide dental examinations, sometimes including full-mouth x-rays and oral



FIRST-AID KIT with unit dressings. Kits may be carried on trucks or kept at first-aid stations in plants. Unit dressings remain sterile till used. (Medical Supply Co.)



# Globe Mouth-to-Mask Resuscitator...\*

A NEW CONCEPT FOR SAFER AND MORE **EFFECTIVE "MANUAL" RESUSCITATION!** 

Now! Realize all the advantages of mouth-to-mouth resuscitation WITHOUT OBJECTIONABLE INTIMATE CONTACT-

When an asphyxial emergency strikes, YOU MUST BE READY. Seconds count, if resuscitation is to be successful. With the M/M Mouth-to-Mask Resuscitator, life-saving resuscitation can be started immediately by anyone at the scene. BE READY . . . with low-cost M/M Mouth-to-Mask Resuscitators strategically located throughout your plant. Anyone, in seconds, can learn to operate this new resuscitator. The Globe M/M Mouth-to-Mask Resuscitator is the easy and natural way to revive the victim of an asphyxial accident. ... For First Aid in Drowning ... Toxic Gas Inhalation ... Asphyxia . . . Electric Shock . . . Inhaled Solvents . . . in All Cases where Breathing is Impaired . . . Especially Effective as a Breathing Assistor in Asthmatic Attacks.

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For Catalog Sheet, Illustrated Instruction Card and Name of Your Nearest Distributor write to:





GLOBE

Medical and Hospital Dept., Globe Industries, Inc. 125 Sunrise Place Dayton 7, Ohio



Here is a complete, new, extremely effective resuscitator. This is the practical equipment for Manual Resuscitation . . and It's Low-Priced, too!

(This price is for the complete M/M unit — including resuscitator, trans-parent face piece, aspirator, airway and carrying bag.) Complete kit weighs only 2 lbs.

### FOR THE PATIENT:

- 1. Effective and Safe for infant, child
- and adult patients.

  The air entering the alveoli contains the full oxygen content (21%) of
- the surrounding air. Air exchange in excess of 1000 ml. is easily accomplished. This is far greater than that provided by any manual method.
- Automatic pressure limiting valve prevents excessive pressures, there. by protecting the lungs of even the smallest infants.
- The only safe manual method for victims with injured chest cage or fractured arms.

### FOR THE OPERATOR:

- At no time is the patient's breath inhaled by the operator.
- The use of the M/M Resuscitator places the rescuer at the patient's head and sufficiently far enough away to monitor chest movement and color of lip without interrupting
- the rhythm of resuscitaion.

  3. A rebreathing system prevents hyperventilation of the operator. The M. M. Resuscitator can be used by one operator continuously for long corrieds. periods.
- The energy expenditure in Mouth to Mask Resuscitation is less than in any other manual method.

NOTE: The Globe M/M Mouth to Mask Resuscitator is completely automatic.

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prophylaxis. Findings are usually referred to the employee's dentist.

### **Mobile Clinics**

A recent development in industrial health service is the mobile clinic which makes it possible to extend medical coverage to more employees.

The simplest type, which consists of a trailer towed behind a car or station wagon, is equipped to give some of the simpler tests. More elaborate is a bus-type vehicle housing facilities for visual, hearing, and x-ray examinations. It is practically a self-sufficient medical department and laboratory on wheels.\*\*\*

### **Health Agencies**

Sources of data on medical service, first aid and occupational hygiene include:

United States Public Health Service United States Department of Labor American Standards Association Industrial Hygiene Foundation Atomic Energy Commission State municipal health departments

# **Poison Ivy**

POISON IVY and poison oak have spoiled many an outing and caused numerous cases of disability among farm, construction, highway, and public utility workers. A wise precaution is to avoid any plant having clusters of three leaves.

Some persons seem able to touch poison ivy without effects; others are poisoned by the slightest exposure. These cases are often difficult to cure.

Poison ivy and poison oak produce an oil which is extremely irritating to the skin. The poison may be carried by clothing or insects or by smoke from burning plants.

Symptoms usually appear within 7 to 10 days after exposure. The blisters are filled with fluid, sometimes pus, which spreads the infection through scratching. If neglected, the rash may spread over a large portion of the body, causing high fever and great discomfort.

If a crew has men who are immune, they should be sent ahead to clear the path of poison plants. However, immunity is not always permanent.

Prevention. As soon as possible, exposed areas should be washed thoroughly with hot water and soappreferably laundry soap. Make a thick lather several times but do not use a brush. That would aggravate the injury. If possible, wash affected areas with rubbing alcohol and rinse with clear water.

Treatment. If a rash develops in spite of this treatment, medical attention may be needed. Mild cases are often cured by washing with hot water and soap, then with rubbing alcohol, followed by application of a 5 per cent solution of ferric chloride. The solution should be applied once or twice a day until the rash disappears.

The ferric chloride solution will often act as a preventive on parts that have been exposed. \*\*\*

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Circle Item No. 199-Reader Service Card

# Snake Bite— Prevention and Cure

AMONG the causes of accidental death in the United States, snake bite is far down on the list. This is due largely to the fact that poisonous snakes are not ordinarily found in heavily populated areas. Most persons have an instinctive fear of snakes and are likely to be extremely cautious in infested areas.

Snakes have never been known to go out of their way to attack humans; they merely want to be left alone. The danger is in coming up to one unexpectedly. The snake strikes in self defense.

Those who work or take vacation trips in regions where venomous snakes are found should wear protective clothing and study the habits of snakes. Much helpful information will be found in National Safety Council's Snake Bite Manual.

Heavy high boots and leggings afford protection against snakes likely to be found in the northern states but heavier garments are needed for defense against some of the tropical and semi-tropical serpents.

Industries most subject to the hazard are snake farms and laboratories, petroleum, construction, public utilities, and agriculture.

# **Types of Snakes**

Venomous snakes in the U. S. fall into four broad categories, three of which are called "pit" vipers because of a pit or indentation between the nostrils and the eyes. In this family are the rattlesnake, the moccasin, and the copperhead.

Their heads are blunt and shaped somewhat like an arrowhead. Venom is injected through two hollow fangs. The size of the snake has little, if any, relationship to the amount or the potency of the venom which may be injected during the bite.

Venom of the pit vipers is quick acting. Its effect is speeded up by unnecessary activity of the victim. Venom travels to the heart via the lymph system, capillaries, and major blood vessels.

Rattlesnakes are found in every section of the United States and in the Canadian provinces along the

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Complete as illustrated. Has regulator with flow control. "Liter Gauge" Oxygen gauge showing the amount of oxygen in the

cylinder at all times, safety valve, face mask, breathing bag and carrying case. 'D' size cylinder. This Unit can be used for either emergency resuscitation or for direct-flow oxygen therapy.

Unit can be refilled over and over again at any Oxygen Supply Co. Components tested and approved by I.C.C. U.S. Bureau of Explosives and Underwriters Laboratories. Portable easy to carry.



Write for prices and literature

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border. They have been reported as far north as Sudbury, Ontario, and in southern Alberta.

Except for rare types, rattlers seldom become more than 6 ft. long. Their rattles usually give warning before they strike but it isn't safe to count on it.

The cottonmouth moccasin is found in the marshes and swamps of the southern states. When surprised it coils, draws back its head, and opens its mouth wide, showing

the white parts of its mouth, hence its name "cottonmouth."

The copperhead is an upland snake. Its habitat is the rocky cliffs that border streams of the Appalachian Mountains. It gets its name from the coppery color of the top of its head. It is sluggish and often allows the victim to get within striking distance before it moves.

The coral snake resembles the non-poisonous snakes in shape. It is

small and colorful. Its seemingly headless body is banded by alternate bands of brilliant black and red, separated by narrower bands of yellow.

Like the cobra and the mamba, the coral snake does not have fangs as such. Its teeth are grooved and the venom flows into the wound through the grooves. A bite looks like a semi-circular series of pinpricks, in contrast to the two fang punctures made by a pit viper.

The quick-acting venom attacks the nerve centers in the brain. The high intensity of the poison accounts for the high mortality rate among victims. Fortunately, bites are few as compared with those of the rattlesnake.

The coral snake is found in Florida, in the states along the Gulf of Mexico and in the desert areas of the Southwest. It is a burrowing snake of nocturnal habits and is not often seen.

Treatment. Techniques of treating snake bite will be found in many manuals. A snake-bite kit should be carried constantly on the person. Best place is a pouch on a belt. Portable kits on the market contain a lancet, a tourniquet and a suction device, also an antiseptic, adhesive bandage, and ammonia inhalant for treatment of shock.

Antivenin does not belong in a first-aid kit. Its use is not without risk and should be administered only under medical supervision.

A comprehensive and practical work on this subject is the National Safety Council's Snake Bite Manual.

# Medical Records

RECORDS are as important in industrial medical service as in any business enterprise. Incomplete or inaccurate records are of little use.

"Paper work" shouldn't be too complicated. A form which will meet the company's needs can be drawn up by the nurse. It may require revision from time to time to add new items or delete others as dictated by experience or changing circumstances.

Data on pre-employment and



Now you can get an ambulance cot that is REALLY LOW — only 8½ inches high — the perfect answer for cars that have less head room, and for overhanging stretchers. The new Washington model 21-L is of special value for heart cases, and other patients who must be kept in a sitting position. Washington's famous top-quality craftsmanship is apparent through-

out this new model cot with such features as sturdy, rigid construction . . . highly polished aluminum tubing and castings . . . very lightweight yet strong . . . trigger release side rails . . . adjustable back rest with nine-position squeeze-lock adjustment. It always pays to choose Washington for the newest and best in all emergency room or vehicle requirements.



periodic health examinations should be included in the medical records. Occupational diseases, and advice or treatment for non-disabling ailments should also be recorded.

Records should include:

### **Medical Records**

- 1. Personal items (employment data)
  - . . Name and address
  - . . Shop number
  - . . Age
  - . . Sex
  - . . Race
  - Marital status
  - 2. Plant items (occupational data)
  - . . Department
  - . . Occupation
  - . . Previous occupation
  - Length of employment
  - 3. Scientific items
  - . . Date of examination
  - . . Physical examination classifica-

In some companies, all employees returning from absences due to physical reasons are cleared through the medical department. Such cases require the following additional data:

- . . Date of onset of symptoms
- . . Date of disability
- . . Diagnosis by attending physician
- . . Name and address of attending physician

Certification of fitness for work from the attending physician or plant physician may also be required. This may involve physical examination, for which findings should be included in the records.

### **Accident Records**

- 1. Personal items
- . . Name and address
- . . Shop number
- . . Sex
- . . Race
- Marital status
- 2. Plant items
- Department
- . . Foreman's name
- . . Occupation
- How long employed
- . . Physical examination classification
- . . Were guards provided and in place? Could they be used?
- . . Cause-mechanical or non-mechanical
- 3. Scientific items
- Part of body injured
- . . Nature and extent of injury
- . . Treatment

- 4. Economic items
- . . Amount of production time lost
- Amount of wages lost
- . . Cost of physician, drugs and hospital

End results

Record cards for various classifications are similar. In some instances, however, items are added to cover special needs. Reference is facilitated if various forms are printed on cards of different color.

An orange card would show an

employee's pre-employment and periodic check-up examinations and visits to dispensary for treatment of nondisabling complaints, with date, complaint, diagnosis and treatment.

A blue card might cover absences from work for nonoccupational

physical reasons.

A yellow card might cover any occupational disease-disabling or nondisabling.

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Circle Item No. 202-Reader Service Card



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Sizes-Small - Medium - Large

Easily stocked — can be worn on either foot—no lefts or rights.

Guard prevents re-injury. Available without guard.

# Wood Sole Acts As Splint

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When a life is at stake, grab your MINUTE-MAN and rus—don't walk—to the scene. You cas run because this compact instrument weighs under 30 pounds, with cylinder, yet combines the functions of resuscitator, inhalator and aspirator. With an extra Midget attachment, it can resuscitate two patients and aspirate a third simultaneously.

The MINUTEMAN protects against ALL respiratory emergencies—smoke or fume suffication, drowning, heart attack, electric

shock, asthma, etc. It operates about 40 minutes with a D cylinder and refills are inexpensive. Pressures are adjustable from Adult to Infant, a range essential in chest injuries, where the patient makes the first efforts to breathe after being overcome, and in working with small children. The instrument is easily regulated to mixtures from 100% oxygen to 50% oxygen and 50% nitrogen from the air. This feature is extremely valuable in prolonged cases, avoiding the possibility of oxygen poisoning.

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TITLE

STREET CITY. STATE

Circle Item No. 203—Reader Service Card

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Circle Item No. 204-Reader Service Card



# 30 N. LaSalle St. . Chicago 2, Ill.



# SAFETY PROMOTION AND TRAINING

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COMMUNICATION means getting ideas across to people, improving both their attitudes and their know-how.

Safety communication uses a variety of media and techniques. One of the oldest of these is the bulletin board, and it's still one of the most useful. The employee publication is another medium which is used with varying degrees of effectiveness for safety presentations.

Signs, commercial and home-made, are useful for more or less permanent messages carrying warnings or instructions.

Pictures on a screen are invaluable aids in training. Slidefilms and motion pictures—color or black and white, silent or talking—can be rented, purchased, or borrowed from several agencies.

agencies.

Even a low-priced camera can produce color slides for projection or black and white pictures for publication and bulletin board use. Photography is a fascinating hobby, too.

# **Lines of Safety Communication**

# Techniques and media that increase know-how and maintain interest

AUDIO-VISUAL AIDS have become indispensable in the safety program. They increase the effectiveness of instruction in good work practices, and develop sound attitudes toward accident prevention.

The more commonly used media of safety communication are:

- 1. Employee manuals
- 2. Motion pictures and slidefilms
- 3. Bulletin boards and posters
- 4. Easels and flipcharts
- 5. Flannelboards
- 6. Employee publications
- 7. Instruction cards

# **Employee Manuals**

These booklets tell the employee what the company expects of him, also what he can expect of the company. Safe practices, work rules, group insurance, medical service, personal service facilities, and other details of employment are explained.

Manuals range from simple mimeographed pamphlets to elaborate illustrated books. Cartoons are often used to give a friendly informal tone to instruction and make rules less forbidding.

### Films

Both motion pictures and slidefilms are valuable for training classes and meetings. Types of films include:

- Strip films projecting individual frames, with the instructor adding the commentary.
- Sound slidefilms using a similar strip, with disk or tape-recorded commentary.
- 3. Separate projection slides with either live voice or recordings.
- 4. Sound and silent movies.

Slidefilms can often be made from photographs taken on the job with amateur equipment. Modern color photography adds realism and attention value to slides and movies, but black and white pictures are useful for some subjects which do not lend themselves to color.

Movies require more expensive

equipment and greater skill in their production but short amateur movies have a place in the program.

Most motion pictures, however, will have to be obtained from outside sources. A variety of films can be rented.

Projection equipment. Projectors for individual slides, slidefilms, and motion pictures with and without sound equipment are available in a wide range of prices. Satisfactory equipment can be obtained at a cost within reach of even the small plant.

An overhead projector can be used in a lighted room. An instructor can draw or write with a grease pencil on a piece of acetate or film positive in front of him. He can point to any important phrase or part of a picture. He faces the audience while the image is projected through a lens onto the screen.

Screens are available in a variety of sizes and prices. The size of the meeting room will govern the choice. A beaded screen is more brilliant over a narrower viewing angle and is suitable for general use. A matte screen is better for shorter

rooms where the audience is spread

# **Photography**

A camera can provide much useful material for the safety program. Slides in black and white and color and enlarged prints for bulletin board and employee publication use are easy to produce.

Still cameras are available in a wide range of prices. These include:

Subminiature — Take negatives from 8 x 11 to 12 x 17 mm.

35 mm.—Preferred for color slides which fit standard projectors.

Twin lens reflex—Negatives on 120 or 620 film, 2½ x 2½ in., make satisfactory enlargements in black and white.

Press camera—The 4 x 5 in. is the most popular size. Prints are large enough for many uses without enlargement. Equipment is rather bulky for amateur use.

One-minute cameras—The Polaroid-Land process produces finished prints one minute after the shutter has been snapped. These



USEFUL DISPLAY BOARD has center panel for projection screen and pegboards at side for mounting posters or objects for demonstration.

are useful when a photographic record of the subject is wanted immediately and extra copies are not needed.

Simple cameras with fixed-focus lenses will often take excellent pictures under favorable conditions but good industrial pictures often require a more versatile camera and a certain amount of skill.

Cameras of all types are available with flash synchronization which makes them independent of outside light sources.

Miniature cameras with fast lenses using fast film can also take many pictures by available light when a flash might be undesirable.

### **Bulletin Boards**

Bulletin boards in prominent locations are excellent media for official announcements and news as well as for safety information and reminders in the form of posters, charts, photographs, and exhibits of protective equipment.

In companies without employee

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SIGN BOARD with changeable letters can be used for special promotions, as in this "Signs of Life" program. (Hanford Atomic Products Operation, General Electric).

publications bulletin boards serve some of the functions of a news-

Unimaginative or unsystematic use of boards impairs their effectiveness. Here are a few suggestions for enlivening the displays:

1. Locate them where they will be seen (cafeterias, recreation rooms, elevator entrances, locker rooms, near time clocks or drinking fountains).

2. Change copy frequently—as often as every two days. Fresh displays always attract more attention.

Keep copy brief. If possible, use less than 100 words for notices and news items.

4. Use large type, art, and color. Cartoons are especially popular.

5. Keep as near eye level as possible—about 63 inches from the floor.

Provide good illumination. Flashing lights attract attention and are sometimes used in nonproducing areas. They may be a distraction in work places.

7. Glass covers protect displays from dirt and defacement and prevent the posting of unauthorized material.

8. Don't fill up boards too solidly with printed matter. Liven them up; don't overdo dignity.

Safety posters are visible evidences of an accident prevention program. Unfortunately, some com-

panies have depended on posters to carry the load and neglected such essential activities as guarding and job instruction. If posters are not backed by sincere effort to eliminate hazards, employees will have little respect for the safety program.

The value of posters is emphasized by the efforts of advertisers to acquire billboard space near factory gates. These locations are frequently used for large safety signboards where both employees and the public can get the message. Outdoor boards are made more effective by floodlighting.

A convenient size for a bulletin board is 22 in. wide by 30 in. high.

Boards should be attractively painted and glass covered. Green, traditional safety color, is commonly used but other colors can be used effectively. One board in a workroom is usually sufficient but in lunch rooms or locker rooms several panels may be used effectively.

Bulletin board displays need not be limited to safety posters. Any subject of interest to employees and management may be used on the boards. In fact, safety posters may have a stronger appeal if displays include other subjects.

One poster alone doesn't do the job. It takes the continual impact of the program. Different posters will appeal to different persons and

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# Signs of Safety They Warn and Instruct

EVERY DAY—at work, in public places and on the highways—we rely on signs for instruction, direction and warning.

Shape, color, wording, and location all help to make signs stand out conspicuously against their surroundings. Recognition of these elements in commanding attention has led to adoption of standards that promote uniformity of design and color.

Some signs, because of their distinctive shape, immediately register their messages. Even illiterate persons can often grasp the meaning at a glance. Examples are the octagonal stop signs at highway intersections and the cross-buck signs at railroad crossings.

Color. According to American Standards Code Z35, Specifications for Accident Prevention Signs, characteristic colors for signs should be:

Red—warning of special dangers. Yellow—caution; possible dangers or unsafe practices.

Green—safety instructions.

Black—directional signs, such as arrows at exits and stairways.

For informational signs any colors except red and yellow may be used.

Commercial signs conforming to specifications of the Code and cov-

ering a variety of messages for nearly every industrial situation are available and special signs can be made to order. Enameled metal, the most frequently used material, is resistant to rust and corrosion and is easy to keep clean.

Visibility is particularly important for warning signs. Special illumination may be necessary in poorly lighted areas.

Black on white and black on yellow are the most visible combinations. Other combinations are white on black; yellow on white; blue on white; white on blue.

Yellow is the most conspicuous color in daylight; red can be seen most readily by artificial light.

Red is universally accepted to denote danger or fire apparatus. This should always be considered in choosing color combinations for danger signs. Color's force should not be weakened by indiscriminate use.

Color combinations that contrast with surrounding colors should be used so they will stand out clearly. Use only permanent colors.

Location is important; a warning sign is ineffective if it cannot be seen easily or if it is too far from, or too close to the point of danger.



REFLECTORIZED SIGNS that pick up the beams of a flashlight are valuable in emergencies when the power fails.

Wording should be brief, clear, and understandable to persons with limited vocabulary.

Whenever nature of the hazard may not be obvious, the sign should, if possible, specify the danger, such as "Gasoline Storage."

The shorter the wording the better, but many persons resent a brusque order, however impersonal it may be. The best sign will, if it expresses more than a mere sterotyped phrase, like *stop* or *slow*, invite cooperation rather than demand conformity.

Lettering should be as large as possible, consistent with balance and legibility. Block letters generally are preferred for signs.

The weight of line in the body of each letter should be about the same as the space between lines.

Tables of distances at which wellproportioned letters can be read by persons with normal vision under good lighting conditions are given in the American Standards Code. This code also offers detailed specifications on construction of standard signs.

Danger signs should not be overworked. They should be restricted to such immediate and serious hazards as high-voltage equipment, toxic and corrosive chemicals, collision hazards, explosives. Employees should be warned of the importance of such signs.

Caution signs warn employees of potential hazards, such as improper use of elevators, cluttered



SIGNS for warning, direction, and instruction are available in standard designs and color schemes to cover practically every contingency. Homemade signs with original messages can be designed for special situations.

aisles, and sparks from grinding wheels; or against unsafe practices such as oiling machinery in motion, smoking in forbidden areas, and operating machines without guards.

Workers should be trained to respond to caution signs as an indication of potential danger requiring care and alertness. The difference between the danger and caution signs is one of degree.

Other general types include safety instruction signs, which designate certain actions or practices; directional signs, and information signs.

Reflectorized signs are useful day or night. In darkness they stand out brightly under the beams of a flashlight. They are available in standard designs for warning, direction, and locating emergency equipment.

Maintenance. Periodic inspection and inventory of signs should be part of the safety program. Signs should receive the same cleaning and maintenance that is given to other equipment. Dirty, disfigured signs are not convincing.

Signs no longer needed should be removed. Where hazards have changed, signs more appropriate to present conditions should be substituted.

Warning tags come in a variety of stock subjects. They are attached to equipment in emergencies to warn others that men are working on machines, that a valve on a pipe line has been shut because of a leak, etc. They are also used on unsafe equipment which is to be removed from service.

Decals are miniature signs which can be attached permanently to machines, walls or other places where a message of warning, caution, or brief instruction is needed. They conform to standard specifications of design and color.

Signboards with changeable letters are available in small sizes suitable for departmental use and larger types which may be erected in conspicuous places near the plant entrance where they can be seen by both employees and the public.

These boards may be used for brief safety messages and for recording the plant's record of no-accident days. \* \* \*









In your plant ... now ... do unmarked hazards threaten employees ... equipment ... production?

No potential danger is too small to be ignored. Stonehouse signs warn of EYE HAZARDS—MACHINE HAZARDS—
FIRE DANGER—RADIATION HAZARDS—
RESTRICTED AREAS—ELECTRICAL AND FALLING HAZARDS plus scores of others. Signs are made of enduring, tested materials, and designed to meet American Standard specifications.

An investment in accident prevention is sure to pay handsome rewards in man hours saved . . . equipment preserved . . . increased production.

And remember, it costs so little!

Write today for our free, full-color, 64 page catalog of thousands of ready-to-ship safety signs, plus information about custom-printed signs to meet your special needs.

"Signs since 1863"



STONEHOUSE SIGNS, INC., Stonehouse Building, 9th and Larimer, Denver 4, Colorado Circle Item No. 206—Reader Service Card



## Communication

-From page 259

to different moods in the same per-

Sometimes a special display may be used to launch a campaign on a theme, such as eye protection or safety shoes.

Notices may inform employees about matters of local interest, such as comparative safety records and contests and reports of accidents

and near-accidents.

Displays of broken goggles and damaged safety shoes and hard hats are interesting and convincing when accompanied by stories and pictures of the workers involved. But object lessons can become monotonous and it takes ingenuity to find new ways of presenting familiar subjects in a fresh way.

Posters, if carefully handled, can be rotated to three boards. They should be discarded when showing signs of wear. Displays should maintain standards expected of advertisements of the company's prod-

Posters bring eye-arresting splashes of color and safety messages to the bulletin board. Often poster displays will catch the new employee's eye on the way to his department. These graphic displays will inform, remind, and often amuse. An occasional light touch has been found effective in getting across serious thoughts.

Jumbo posters, 81/2 x 11 ft., are often placed on boards in conspicuous locations where the employee cannot fail to see them when coming to work or leaving the plant. If they can be seen by the public passing the plant, they will also help to make a favorable impression.

Jumbo posters may be obtained from the National Safety Council on a monthly service basis. Billboards may be decorated with original art work, perhaps including a scoreboard for the plant's record of accident-free days.

### **Easels and Flipcharts**

Easels and flipcharts are helpful in conducting meetings. Examples of this type of material are the National Safety Council's

115-117 WORTH ST. NEW YORK 13, N. Y.

Serving Industry Since 1861

READY MADE SIGN COMPANY, INC.

for SAFETY

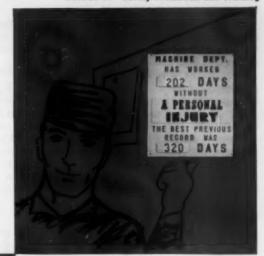
Circle Item No. 215-Reader Service Card

LOCK ELEVATOR

BEFORE LOADING

AND UNLOADING

build pride in your program!
display your successful
safety record with attractive
embossed safety signs made
to your specifications





Now you can have your own, eye-catching embossed signs that proudly announce company safety records, at a cost so low they can be displayed in every department of your plant!

Each sign provides special channels into which 2" numerals or letters may be snapped, permitting you to change figures each day as records mount. The channels can be formed in any position, as needed. Compartment boxes for storing supplies of numerals are also provided.

Sample signs shown here are  $34^{\prime\prime} \times 19^{\prime\prime}$  and  $24^{\prime\prime} \times 19^{\prime\prime}$ , utilizing  $1^{1}/_{4}^{\prime\prime}$  and  $2^{\prime\prime}$  embossed letters, with two channels for  $2^{\prime\prime}$  snap-on numbers. White plastic background with message in any color.

Foreign languages can be processed at no extra cost.

Inquire about our full line of safety signs.

REPAIR SE HAS WORKE 189 DAYS WITHOUT

A MOTOR VEHICLE ACCIDENT

THE BEST PREVIOUS RECORD WAS 1984 DAYS

AD-O-PLASTICS

Plastic Sign Specialties Woodbridge, New Jersey Safetygraphs, each dealing with a specific topic. They are designed for use by foremen and others in holding meetings with small groups.

Safetygraphs are collections of drawings, cartoons, charts, and other illustrations printed on heavy paper and spiral-bound in a folder that opens to form an easel. With the large illustration facing the audience, the instructor discusses the subject, using his own words or reading the suggested talk on the back of the illustration.

Flannelboards can be used effectively to present outline of talks and illustrative material.

# Safety Instruction Cards

Cards 3 x 5 in. covering safe methods for practically every type of industrial operation, as well as seasonal and off-the-job subjects, are issued to employees as part of their job instruction. Often they are placed near the bench or machine to serve as reminders.

While the messages on most in-

struction cards are rather long to serve as posters, some companies make enlarged photostats of the cards and mount them on bulletin boards.

# **Employee Publications**

Employee publications furnish an excellent medium for safety communications. These publications range from simple mimeographed bulletins to elaborately printed and illustrated magazines. Illustrated safety stories are regular features in many publications.

Most publications carry news of employee and company activities but some are strictly safety bulletins for employees, supervisors, and special groups. \* \* \*

# Getting the Most Out of Meetings

FOR UTMOST effect in motivating and supplementing instruction, audio-visual aids should be chosen to fit in with the method of instruction to be used, group to be instructed, and objectives to be achieved.

Audio-visual aids should serve

- 1. Formulate correct ideas.
- 2. Create interest.
- 3. Intensify impressions.
- 4. Broaden experience.
- 5. Save learning time.



A FLANNELBOARD is a useful visual aid in training programs. Here it is used to outline and stress major points in a talk as the speaker progresses.

# HELPS YOU SELL SAFETY . . . AND KEEPS IT SOLD!



That's the job of the Elliott Hi-Vision Program. Highly flexible, effective, yet low-cost, it moves more minds more often than any other in-plant approach. Amplifying your personal efforts at the important work-level, Elliott Hi-Vision penetrates the indifference barrier by:

- Exposing your safety problems
- Defining your safety goals
- Emphasizing employee responsibility
- Encouraging safety participation

Colorful samples
are yours
without obligation.
Simply fill out
and return the coupon.

	RVICE COMPANY, INC. 1, MOUNT VERNON, N. Y.
	Please provide me without obligation, further informa- tion and samples of your Hi-Vision Safety Program
Name	
Title	
Firm	
Address	
City	ZoneState



Cross-country pipeline-89 miles long, built from Tulsa to Ponca City by Pipeline Service Company. Here you see a crew laying pipe in open country... but the line also goes through towns, under a river, and right beneath an oil refinery. Employers Mutuals Men went over

this route before construction began, examining some sections foot by foot. This care in pointing out the areas where special risks called for special coverage saved the construction company an estimated \$10,000 on their insurance.



Know and show-that's Employers Mutuals' practical plan for on-the-job safety training. Joe Heasley (standing) is job superintendent on a Steelman Construction Company highway project. He gets special safety training . . passes this on to men like Seldon McEntire when they take over new equipment.



Counting stars-A month without an accident adds a star to the driver's record in the continuous safety contest at Hale-Halsell Company, wholesale grocers in Tulsa and Durant. D. Smith (left), Tulsa General Manager, adds up the stars won by Claude Henderson (right) in ten years of accident-free driving.

In the Sooner State they've found a way to set new records!

by MARION CRACKAFT Oil and Business Editor The Tulsa Tribune



"Here in Oklahoma we're used to getting things done in a hurry . . . so, instead

of speed, the records we're after in business and industry have to do with safety and savings! And helping us are the people from Employers Mutuals with the 'Wausau Way of Working'.

"That means a lot. For proof visit Hale-Halsell, the wholesale grocery company. Talk to L. D. Smith, Tulsa General Manager. He'll tell you that his company, working with Employers Mutuals Men, cut warehouse accidents by 91%—improved the safety record on their fleet of trucks to cut the insurance costs in half.

"Then there's the \$10,000 savings made by the Pipeline Service Company. That's just the beginning. Employers Mutuals Men continue to work with the construction company to keep accidents from happening. With help like that, the total savings can top the original \$10,000 by far.

"You see, Employers Mutuals Men know how to make safety work and how to make it pay. They're 'good people to do business with'. Add the 'Wausau Way of Working' to the Sooner State's enthusiasm and energy . . and new records will be set!"

Employers Mutuals, with offices all across the country, writes all forms of fire, group and casualty insurance (including automobile). We are one of the largest in the field of workmen's compensation. For further information see your nearest representative (consult your telephone directory) or write us in Wausau, Wis.

# Employers Mutuals of Wausau



Good people to do business with

# ONCE IN 25 YEARS

\$7550\*

FREEI

with

Award Incentives, Inc. 25th Anniversary

E-Z AWARD PLAN

Value \$135.00

WHAT YOU GET!

- Your own Safety Die
- 9 Personalized Awards
- 1 Permanent Display Case
- Launching Package (to start the ball rolling)

All For \$59.50

\*Gives You \$75.50 Free!

### WHY IT'S EASY!

No bother with details in our Package Plan. Management sure to okay as you save before you spend. Pegboard Display Case shows employees what they're working for—makes Safety Everybody's Goal! Rumsey Transportation, Western Electric & many more use this successful, easy way to make Safety \$\$ Pay Off!!

AWARD INCENTIVES, INC.

200 William St., N.Y. 38, N.Y. LIMITED OFFER ENDS March 31, 59 Write for Details—Free!

AWARD INCENTIVES, INC. 200 William Street, N.Y. 38, N.Y.

Address...

City & State\_\_\_\_\_\_Title\_\_\_\_

LIMITED OFFER—NSC—March 31, '59 Circle Item No. 225—Reader Service Card No matter how good the aid, its effectiveness will be determined largely by the way it is used. Audiovisual aids have the advantage of being easily understood, even by poor readers.

It should be remembered that audio-visual aids are not a complete program in themselves. Here are some suggestions for their use:

- The user must know his subject and be thoroughly familiar with the aids.
- Material must be introduced properly. Tell the audience what to expect and its significance.
- Avoid distractions, such as noise, improper focus.
- 4. Don't use too many devices.
- 5. Plan the sequence.
- Try for exact timing and smooth handling.
- 7. Be sure material is pertinent and clearly displayed.

Audio-visual aids may be rented or purchased. Some may be made to order by an outside agency or within the plant.

Following are some of the aids used:

- 1. Charts—from 8½ x 11 in. to 30 x 40 in.
- Models, mock-ups, demonstrations.
- 3. Flannel boards.
- 4. Movies.
- 5. Slidefilms
- Tape recorders and microphoneequipped dictation machines.

How much did they learn? After a meeting in which any of the above aids are used, see how much the group has learned. This may be done by oral questions, written tests, or performance tests. \* \* \*

# Employee Manuals— Guides, Not Rules

Manuals outlining company policies and work conditions are used in employee induction. These booklets cover general matters dealing with employer-employee relationships, including safety, medical and health service and related topics. Sometimes a smaller booklet containing only safety suggestions is issued.

Stiff, formal lists of rules are be-

ing replaced by friendly, helpful explanations of company policies for employee guidance. Whimsical cartoons can make even orders seem less arbitrary.

Putting this information in print in itself indicates that management is interested in accident prevention. It also is more reliable than verbal instruction.

Books are not a substitute for personal supervision, but it helps the supervisor to have the information in printed form.

Printed rules should be introduced by management endorsement and brief explanations of why rules are necessary, pointing out how the employee gains by safe work practices.

Rules should be reviewed at intervals to consider adding new items brought about by changing conditions and altering or deleting those that may no longer be applicable. Sometimes it will be found that it is not new rules that are needed but improvement in supervision in other media of communication.

Rule books alone cannot be

—To page 271

# Safety Engineers

Foreign Employment

Career opportunity for graduate engineers with minimum 5 years practical safety engineering experience in all operations, heavy industrial or chemical industries.

Must know A. P. I. codes and be familiar with hazards peculiar to oil industry. Capable of planning, developing and obtaining acceptance and support for complete accident prevention program.

Write outlining experience and personal history to:

RECRUITING SUPERVISOR BOX 329

Arabian American
Oil Company
505 PARK AVENUE
NEW YORK 22, N. Y.

# Section Asks Lists Of Specialized Groups

In October 1957, an Industrial Agriculture Division was added to the Food Section of the National Safety Council. Since then the names of the section and the division have been changed. It is now the Agriculture Division of the Food and Beverage Section.

The Agriculture Division will work in close cooperation with the Council's Farm Division, but will in no way supplant it. Since the Agriculture Division of the Food and Beverage Section carries its concern through the transportation and processing phases, there will be some areas in which their treatment will supplement the basic safety data concerning the farm that is available from the Farm Division.

To enable the Agriculture Division to serve members more effectively, the Section would like to have the names, titles, and locations of key personnel in member organizations who might appropriately be considered in the Agriculture Division rather than in the Food Processors and Canners Division. The section would also like to have the names of those whose activities would place them in both divisions.

Such lists, with the two types of designation noted above, should be sent to Ray Ellis, Jr., Staff Representative, National Safety Council.

# Fuel Additive Reduces Static Hazard

A new additive that shows promise of reducing static hazards in a wide variety of hydrocarbon fuels and solvents by increasing the electrical conductivity of such fuels now is available for developmental testing from the Du Pont Company.

Known as SCA-100, the nonmetal-containing additive may prove useful in both refinery stocks and finished products where there is hazard of explosion or fire induced by static discharge.

Chemically a mixture of complex organic nitrogen-containing compounds, the new additive appears to be effective in fuels which develop either positive or negative electrical charges. Possible applications include gasolines, rocket fuels, solvents, kerosene, distillates, diesel fuels, refinery feed stocks, and naphthas, according to Du Pont's Petroleum Laboratory.

While laboratory bench tests indicate SCA-100 is effective in reducing static hazards, Du Pont chemists said the new compound should be treated at this time as a development product, pending fullscale trials.

Exact recommendations as to usage must await results of field tests, but laboratory results indicate that concentrations of three to ten pounds of SCA-100 per 1,000 barrels of product give a significant reduction in static charge accumulation and an increase in electrical conductivity.



# For a More Successful Poster Program

A LITTLE HORSE SENSE
WILL PREVENT
A LOT OF
ACCIDENTS

JUMBO POSTER FOR MAY 1959

The Jumbo poster, issued monthly, is designed for outdoor use and is available to members on annual subscription but is not stocked, its actual size is 9' 11' by 11' 8''.

### SAFETY BANNER FOR MAY, 1959

Here is the attention-getting, monthly cloth banner. Available in two types—indoor and outdoor—both are identical in size (10 feet long by 40 inches high), have the same general message and multi-color design. Indoor type is of sturdy drill with grommets for easy hanging, while the outdoor banner is of extra heavy drill with wind vents, and has strong stitched-in rope for durability.

POSTERS illustrated on the following pages are new, and actually are printed in two or more colors. NOTE: (1) The new 1959 poster directory is also available—with a wide variety of subjects. Stock of those directory-listed posters will be available at least until October 1, 1959. (2) Most posters appearing in NATIONAL SAFETY NEWS in 1959 will be stocked throughout the year.



1566-A

81/2 x 111/2

This new four color poster is illustrative of the 72 four color posters shown in the 1959 Poster Directory.



Electrotypes of poster ministures on this page are not available, nor can payroll inserts be supplied

# Posters below are printed in two or more colors (Available only in sizes indicated)



1565-B











81/2×111/2

17x23

1548-A

1496-A 81/2x111/2



81/2x111/2

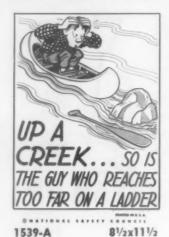




Electrotypes can be furnished for all posters illustrated above.

Posters below are printed in two or more colors
(Available only in sizes indicated)













POST	ER ORDER	FORM	
SHIP TO:			
Organization			
Address			
City	Zone	State	
Te attn. of			
SEND INVOICE TO:			
Organization			
Address			
City	Zone	State	
To attn. of			
ORDERED BY			
Custemer's P.O. Number			

	' SIZE	(EXCEPT PREFIX T		SIZE "C"
10-99 \$. 100-999 .	12 07 06	\$.23 .195 .155	\$.20 .165 .132	\$.40 .30 .24 .22
Prices subject to fless than S. Quantity	to 10% d 3.00 plea Poster	se enclose	members. W check or i	Tith all order money order Poster No.

ADDRESS ORDER TO: NATIONAL SAFETY COUNCIL, 425 N. MICHIGAN AVE., CHICAGO 11, ILLINOIS

Electrotypes can be furnished for all posters illustrated above.



# PREVENT BACK INJURY! SHOW THEM HOW TO LIFT THE RIGHT WAY

"LIFTY"



Lifting heavy objects the wrong way can cause hernias and severe back injuries. "Lifty," the animated training tool that really puts a point across, dramatically shows your workers just how such injuries are caused by incorrect lifting . . . and shows them how to lift the right way, with the legs instead of the back.

24" high, sturdy wooden construction. 2 models available; clear lacquer or in 3 colors.

### TRAINING AIDS

235 Iroquois Road Hillside, Illinois

Circle Item No. 209—Reader Service Card National Safety News, March, 1959

# **Employee Manuals**

-From page 266

counted on to change attitudes or impart much information. However, they are useful aids in a well-planned, persistent accident prevention campaign.

Few employees will read the manuals from cover to cover without an outside stimulation. Manuals can, however, add much to the program if their contents are reviewed briefly when presented and during occasional informal quizzes.

Individual cards covering work practices for specific operations sometimes may be used effectively to supplement general material in the manual. \* \* \*

# **Medical Records**

-From page 255

A white card would list all disabling accidental injuries.

With these cards, the employee's file would contain his complete health record, easily analyzed under several important categories.

With such a set of records kept over a year, it would be possible to obtain many types of information. For example, by noting the ages of accident cases, the doctor, nurse or safety director could tell whether older or younger workers suffered more injuries.

By running through the cards by departments, it is possible to pick the danger spots in the plant and concentrate on them.

Helpful information about types of injuries could be obtained by this method. The number and severity of infections as revealed by the cards might indicate the effectiveness of first-aid methods.

Number of fractures and periods of disability, number of treatments for complete healing of lacerations could be studied. Many other studies could be made and the findings applied.

Names and addresses should always be recorded. In case an employee should be absent the day after treatment, it may be important to learn whether his absence is the result of the injury. A correct address on the record facilitates investigation. \* \* \*

# IMPORTANT BOOKLETS THAT SAFETY DIRECTORS ARE BUYING FOR EMPLOYEE DISTRIBUTION



 published by the nation's leading commercial publisher of employee safety booklets.

A sample capy of any of these booklets can be obtained for review purposes by checking the appropriate box and sending in this ad together with a covering letter (an year firm letterhood, please) requesting the material.

Check box if you wish sample copy for review



"HOW	10	SURVIVE	THE
SUMI	MER	125	

"KEEP	ING	MOM	SAFE"

"SKILL,	SAFETY	AND	SPORT
IN SW	IMMING'	,	

		"BOATING	FUN	IN	SAFETY
--	--	----------	-----	----	--------

"POTENTIAL POISONS	IN
YOUR HOME"	

				-
"WHAT'S	NFW	IN	FIRST	AID"

"DANGERS	IN	THE	KITCHEN'

(This is a partial list of titles—catalog will be mailed on request.)

All of the above are 16 page, two color booklets and beautifully illustrated. Prices: To 99 capies 11g each; 100 to 499 capies 10g each; 500 to 999 capies 8½g each; 1000 to 4999 capies 7g each; 5,000 to 15,000 capies 6g each. Prices quoted are FOB, New York City. Imprinting available at \$7 per thousand. Minimum imprint charge \$7.

ALL REQUESTS FOR SAMPLES MUST BE ACCOMPANIED BY A COVERING LETTER ON YOUR FIRM LETTERHEAD. ONLY SUCH REQUESTS WILL BE MONORED.

Detach this ad along here....

AMERICAN VISUALS CORPORATION 460—4th Avenue New York, N. Y.—Attn: Bob Menchin



Name and	title	
Address		

Tone State

Check here, if you wish to be placed on our mailing list for future announcements.

Circle Item No. 210-Reader Service Card

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Titles of sections in bold face

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# DAV-SON offers the biggest selection of

# SAFETY-BULLETINS

Free Catalog

No matter what type of bulletin board you seek-cork, chalk, changeable letter-wood, metal, glass front, lighted-you'll find it in the big NEW Dav-son Catalog. Get yours.



We are manufacturers of bul-letin boards for every purpose. Changeable letter directories, production control and sales bulletin beards, organizational charts, cork back boards, and special display boards of all

CONSULT US

50n

METAL SAFETY SIGNS Hundreds of stock items DAV-SON CORK BACK BULLETIN BOARD For Inside or Outdoor Use Wood or Metal Frames

- Glass Enclosed or Open
- Real Cork Mounting Surface Illuminated or Non-Illuminated
- Many Sizes, Low Cost





A.C. DAVENPORT & SON. INC. 311 N. DESPLAINES ST., CHICAGO 6, ILL.

MANUFACTURERS OF BUILTIN BOARDS FOR EVERY NEED

DAV-SON

"The Safety Director"

Flashing Color, Change-

obic Letter Display for

Timely Safety Mes-

sons. The most effec-

tive safety bulletin

mode. Write for special

circular.



"Circle Item No. 212-Reader Service Card

Cleaners, vacuum: 27 Cleansers, skin: 59 waterless: 59, 70 Clothing, protective: 62, 116, 132, 133 welder's: 160 Coatings, translucent: 48 Color: 29, 32, 35, 98, 106, 196 Combustible gas indicators: 233 Compressed air: 80 Construction, fire-resistant: 222 Covers, waterproof: 177 Cranes, portable: 76 Creams, protective: 136 Cups, paper: 64 Cuspidors: 72 Cutting oils: 65 Cylinders, compressed gas: 175 Decals: 261 Deodorants: 50 Detergents: 50, 70 Disinfectants: 96 Dispensaries, medical: 162 Distribution of equipment: 4, 140, 160 Driers, electric hand: 71 Drinking water: 64 Dust collectors: 73, 74, 61, 160 Ear protectors: 80, 84 Electrical equipment: 56, 172, 198 Exhaust purifiers: 193 Exhaust systems: 61, 94 Extinguishers, portable: 213, 229 Extinguishing systems, fixed: 216 Eye conservation: 90, 102, 106, 118 Face shields, plastic: 92 Fans and blowers: 60, 73 Filters, air: 74, 93 Fire protection: 173 alarms: 216 brigades: 120, 220 detection: 216 doors: 222 in metals: 239 Flameproof fabrics: 92, 135, 136, 158, 160 Flammable liquids: 232 Floors, care of: 48, 56 coatings: 35, 48 machines: 28 materials: 20, 46, 58 Food service: 68 Foot protection: 140 footguards: 142 safety shoes: 140 toe clips: 143 Fountains, drinking: 64 eye: 59 wash: 58 Fungus infections: 59 Fuse pullers: 172 Fuses: 208 Gas masks: 93, 126 Gloves: 51, 136, 172 Goggles: 90, 91, 92, 102, 106 Guards, machine: 196, 118 Hands and arms: 116, 136, 51 Head protection: 98 Hearing aids: 86 Helmets, welding: 90, 92, 102 High-voltage equipment: 172 Hoists: 186 Hose, fire: 212 Housekeeping and maintenance, 25, 48 Hydrants: 212 Industrial Health Engineering: 57 Knee pads: 154 Ladders: 38 fixed: 24 light metal: 38 portable wood: 38 shoes: 44 stabilizers: 44 Leg protection: 154 Lighting: 19, 55 emergency: 130 Linemen's equipment: 172 Lockers: 58, 72 Lubrication: 204

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From Bell Telephone Laboratories...

# **Brainpower**

for the brawny

# **Nike-Hercules**

The Army's newest surface-to-air guided missile—the lethal Nike-Hercules—is now operational. Because it is, no unfriendly plane will be able to fly sufficiently high, fast or evasively to escape a fatal rendezvous with it.

For Hercules has a "brain"—an intellect that makes it a prodigy among today's electronic robots. Bell Telephone Laboratories developed it. Western Electric (prime contractor for the entire missile system) is producing it. Douglas Aircraft Company is giving it its body.

This "brain" is a fully integrated guidance system, almost entirely land-based. Only the vital signal-receiving apparatus is expendable within the missile itself. Other highly practical features: it defies "jamming," is completely mobile, is designed in separate "building block" units which are replaceable in seconds—and is deadly accurate.

Bell Labs scientists and engineers designed the world's largest and most intricate telephone communications network for the Bell System. They developed about half of the Armed Forces' radar equipment during World War II. And they pioneered the nation's first successful air defense guided missile system—Nike-Ajax.

They were eminently qualified to give Hercules the brainpower it needed.



BELL TELEPHONE SYSTEM



Vigilant acquisition radar for Nike-Hercules first detects approach of distant aircraft, pinpoints its location and instantly signals to battery control.



Two tracking-radar antennas, housed in radomes, take over. One feeds target azimuth, elevation, range data to computers; other tracks Hercules.



Two sets of radar data are electronically computed and plotted. Hercules is "steered" by radio signals, then detonated at precise point of interception.

Circle Item No. 213-Reader Service Card



### On Blue Streak® Dispenser Cards

If it's to be numbered, marked or identified, this is the low cost, simple way to do it. Brady Numbers and Letters stick instantly, permanently — provide quick identification in any combination for areas, columns, aisles, fire stations, pallets, shelves, bins, drawers. Six stock sizes: ½", ¾", 1½", 2¼", 3½" or 5" Black legends on yellow super-strength vinyldrawers. cloth. Specials made to order . . . variety of colors.

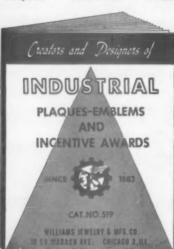
WRITE FOR FREE WORKING SAMPLES

W. H. BRAD

Manufacturers of Quality Self-Sticking Industrial Products. 734 West Glendale Avenue • Milwaukee 9, Wisconsin • Est. 1914

Our NEW 1959 EDITION ... 40 PAGE CATALOG of **EMBLEMS** • PLAQUES • TROPHIES • INCENTIVE AWARDS

IDEAS FOR SAFETY **PLAQUES TROPHIES** and INCENTIVE **AWARDS** 



THE ONLY CATALOG OF ITS KIND!

Get Your Copy Today! Keep it Handy to Solve Your Awards **Problems** 

### JUST OFF THE PRESS!

WILLIAMS JEWELRY & MFG. CO. 10 S. WABASH AVE., CHICAGO 3, ILL. SILVERSMITHS BUILDING — CEntral 6-5018

Circle Item No. 214—Reader Service Card

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THE ANNUAL Safety Equipment issue serves as a single, complete source of purchasing, use, and maintenance information on safety equipment.

Section 12, the Directory of Safety Equipment Sources and the Classified Safety Product Index, pinpoints the sources of 600-plus safety products available from over 500 companies.

The Classified Safety Product Index is arranged into groups—the same 11 groups that make up the editorial-advertising sections. Section 4, for example, is devoted exclusively to Noise Control material both in the editorial section and the Classified Safety Product Index.

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So-Cal Equip. & Supply Co., 7227 Van Nuys

Bird. Van Nuys, Calif.

Santa Santa Crus, Calif.

Schloss & Shubart, 1828 Waree St., Watson
ville, Calif.

Schloss & Shubart, 1828 Waree St., Denver,

Cole. Schless & Bhubart, 1828 Wasee St., Denver, Colo. Colo. Electric Equip. Co., 219 Gilbert St., Bridge-port 4, Conn. RAE Bearings Service, 106 Revere St., Bridge-port 7, Conn. RAE Dearings Service, 2248 Whitney Ave., Desirings Service, 106 Revere St., Bridgeport I, Conn.

Bar Service, 2248 Whitney Ave.,

Hamden 14, Conn.

RAE Bearings Service, 628 Capitol St., Hartford 6, Conn.

Kapian Bros., 1663 R. Main St., Waterbury 4,

Conn.

Bearings, Inc., 18th & Governor Prinx Bivd.,

Wilmington, Del.

Cameron & Barkley Co., 605 E. Forsyth St.,

Dikle Bearings, Inc., 1828 Iomia St., P. O.

Box 3705, Sta., "F", Jacksonville, Fis.

Willer Bearings, 1132 Florida Ave., Lakeland,

Fis.

Fis.

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Fis.

Cameron & Barkley Co., 222 N. V. Miller Bearings, 1132 Florida Ave., Lakeland. Fla.
Causeron & Barkley Co., 737 N. W. First Ave., Miami S. Fla.
Miami S. Fla.
Miami S. Fla.
Miller Bearing Service, Inc., 3701 N. W. 32nd Ave., Miami, Fla.
Miller Bearings, 317 N. Magnolia St., Ocala.
Canseron & Barkley Co., 1562 N. Orange Blossom Trail, Box 1871, Orlando, Fla.
Miller Bearings, 919 W. Central Ave., Box 2047, Orlando, Fla.
Holley, Inc., Bldgs, 134-125, Municipal Airport, P. O. Box 705 Tallabassee, Fla.
Ball & Boller Bearing Co., 715 Jefferson St., Canoren & Barkley Co., 107 S. Franklin St., P. O. Box 909, Tampa 1, Fla.
Dixie Bearings, Inc., 276 Memorial Dr., S. W., Atlanta, Gs.
Columbus Iron Works Co., 601 Front Ave., Columbus I, Ga.
Bearings & Drives, Inc., 315 Arch St., Macon, Macon, Machiner, Co., 180-120 N. Second Ave., No. Ga.

Bottey Machinery Co., 199-139 N. Second Ave., Rome, Ga.
Bearings & Drives of Savannah, Inc., 1214 Bay St., Ext., P. O. Box 1328, Bayannah, Ga. Cameron & Barkiny Co., 13 Water St., P. O. Western Bearing, Inc., 529 Front St., Boise, Idaho Canaren & Barkiy Cs., 18 Water St., P. O. Box 1867, Savannah, Ga. Western Bearing, Inc., 559 Front St., Boise, Transmissien Products. Div. of Parma Water Lifter Co., Parma, Idaho Western Bearings, Inc., 158 S. Third St., Pocatello, Idaho Western Bearings, Inc., 158 S. Third St., Pocatello, Idaho Chicago Pulley & Shafting. Co., 17-23 N. Desplaines St., Chicago St., 180, 223 Fourth Ave. West, Twin Palis, Idaho Chicago Pulley & Shafting. Co., 17-23 N. Desplaines St., Chicago St., 180, 2486 S. Michigan Ave., General Bearings Co., 2486 S. Michigan Ave., Barreyn, III.
Ring, Ray M., Co., Inc., 6616-16 W. Washington Burd, Chicago 44, III.
Ndidatate Machinery Co., 359 E. Main St., Decatur, III.
Neiran Bearings Co. of III., 812 Illinois Ave., East St. Louis, III.
Pickard Industries, Inc., Central Mine Supply Div., 213-224 S. Third St. Mt., Verson III.
Adams R., Peoria S., III.
Adams R., Peoria S., III.
Transmission Supply Co., 936 Knoxville Ave., Peoria 4, III.
Ring, Ray M., Co., Inc., 1125 Railroad Ave., Rockford, III.
Ring, Ray M., Co., Inc., 125 Railroad Ave., Rockford, III.
Ring, Ray M., Co., Inc., 3481 Michigan Ave., East Chicago, Ind.
Evanville Supply Co., 210 Pennsylvania St., Peoria S., Peoria S., Ind.
Bearings, Inc., 891 N. Capitoi Ave., Indian-polis 6, Ind.
Transmission Supply Co., 1815 S. Antheny Blied, Fort Wayne 2, Ind.
Bearings, Inc., 891 N. Capitoi Ave., Indian-polis 6, Ind. Berrings, Inc., 482 Pearl Bl., Fort Wayne 2, Ind.
Bearlings, Inc., 891 N. Capitol Avs., Indianapolis 4, Ind.
Transmission Supply Co., 1844 W. 18th Bl.,
Indianapolis, Ind.
Bearlings, Inc., 391 N. Madison, Muncia, Ind.
Bearlings, Inc., 1842 E. Wabash St., Terre
Hauts, Ind.
Industrial Engineering Equip, Co., 122-124 E.
4th Bl., Davenport, Iowa
Electrical Engineering & Equip. Co., 1291
Walnut Bl., Dea Molnes T. Iowa
Smith Electric & Industrial Supplies, 415-17
Jenes Bl., Nioux City I, Iowa
Walley, Ind., Industrial, Supplies, 415-17
Jenes Bl., Nioux City I, Iowa
Well, Lexington S., Parts Co., Inc., 240 Clark
Bearlings, Inc., 218 Warneck St., Lessieville & Ky.
Dixio Bearlings, Inc., 215 S. Fleed St., Louisville 3, Ky.
Pickard Industries, Inc., Central Mine Supply
Dix., 284 W. Center St., Madisonville, Ky.

Kentucky Bearings Service, Inc., 710 E. 4th St., Owensbero, Ky. Petter, Henry A., Supply Co., 117 S. 1st St., Paducah, Ky. Dizie Bearings, Inc., 2005 Weller Ave., Baton Rouge 9, La. Rouge Law.

Rouge Law.

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Round Law. Stanley J., Co., 04 Trans.

Mains

Stanley J., Co., 25 Union St., Portland
com, Stanley J., Co., 25 Union St., Portland Maine ngs, Inc., 1961 Howard St., Baltimore 18, Bearings, Inc., 1901 Howard St., Baltimore 18, Md. Zies, Charles, & Sons Co., 314 S. Fremont Ave., Baltimore 39, Md. Bearings Specialty Co., 665 Beacon St., Boston 15, Mass. 15. Mass.
Machinery Sales Corp., Elm, Water & Bethel
Sts., Box 387, New Bedford, Mass.
Bearing Distributors, 337 Fenn St., Pittsfield,
Mass.
Berkshire Mill Supply Co., 47 Clapp Ave.,
Pittsfield, Mass.
Pos., W. J., Co., 112-116 Broadway, Springfield Bearing Distributors, 337 Fenn St., Pittsfield, Mass.
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Fos., W. J., Co., 112-116 Broadway, Springfield
Beierly, Lombard & Co., Inc., 107-9 Foster St., Worcester S, Mass.
Royall, Inc., 4705 Washtenaw Rd., Box 623, Ann Arbor, Mich.
Flood Supply Co., Crystal Falls, Mich.
Carlson-Dimond & Wright, Inc., 14221 E.
Pottol Baply Co., Crystal Falls, Mich.
Carlson-Dimond & Wright, Inc., 14221 E.
Detroit Ball Bearing Co., Mich., 109 W., Alexandrine Ave., Detroit I, Mich.
Detroit Ball Bearing Co., of Mich., 25345 Plymouth Rd., Detroit 39, Mich.
Detroit Ball Bearing Co., of Mich., 25345 Plymouth Rd., Box 136, Van Dyhe, Mich.
Detroit Ball Bearing Co., of Mich., 3501 N.
Saginaw S., Wing, M. Mich.
Detroit Ball Bearing Co., of Mich., 48-50 W., Filott I, Mich.
Detroit Ball Bearing Co., of Mich., 48-50 W., Fulton St., Grand Rapids 2, Mich.
Detroit Ball Bearing Co., of Mich., 424 Harrison St., Kalamazoo, Mich.
Detroit Ball Bearing Co., of Mich., 425 E.
Michigan Ave., Jackson, Mich.
Detroit Ball Bearing Co., of Mich., 425 E.
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Michigan Ave., Jackson, Mich.
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Michigan Ave., Jackson, Mich.
Detroit Ball Bearing Co., of Mich., 425 N.
Washington Ave., Baginaw 2, Mich.
Detroit Ball Bearing Co., Jac., 1016 E. Superior
Marshall-Walle/Kelley-How-Thomson Co., 309 S.
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Arrowheed Bearing Co., 1224 Harmon Place,
Paul 4, Minn.
Mississippi Bearings, Inc., 243 S. State St.,
Natches, Miss. Opher Bearing Co., 522 N. Prior Ave., St. Opher Bearing Co., 522 N. Prior Ave., St. Opher Bearings, Inc., 843 S. State St., Jackson, Miss.
Peerless Supply Co., Inc., 200 State St., Natches, Miss.
Scott Supply Co., Inc., 1919 Baltimore Ave., Joplin, Mo.
Bearing Distributors, Inc., 1919 Baltimore Ave., Kannas City 10 Mo.
Webb Belting & Supply Co., 1501 W. 12th St., Kannas City 10, Mo.
Webb Belting & Supply Co., 1501 W. 12th St., St. Louis 1, Mo.
Bearing Distributors, Inc., 1501 Delmar Bivd., St. Louis 1, Mo.
Pre-Co. Inc., 801 N. 2nd St., St. Louis, Mo.
Weissman, Carl. & Sons, 380 3rd Ave., South.
P. O. Bot 1294, Great Falls, Mont.
Missoula Mercantile Co., 1600 Harker Ave., Missoula Mort.
Acma Bearing Service, Inc., 2509 Dodge St., Missoula, Mont.
Acma Bearing Service, Inc., 2509 Dodge St., Omahs 2, Neb.
Sierra Industrial Co., Inc., 307 Morrill Ave., P. O. Box 1339, Reno, Nev.
Perkins, Bansett & Wright, Inc., 391 West St., Keene, N. H.
Bearings, Inc., 1035 Wright Ave., Clifton, N. J.
Bobker Bearings, 515 Raritan Ave., Highland Park, N. J. N. J.
Bobker Bearings, 515 Raritan Ave., Highland
Park, N. J.
Bobker Bearings, 3239 Hudson Blvd., Jersey
City 8, N. J.
Bobker Bearings, 248 Central Ave., Newark 4. N. J. States, 220 Cutters Ave., Newark 4, Mathewson, Geo. A., Co., 415 Raymond Blvd., Newark 5, N. J.
Wiley-Hughes Supply Co., Inc., New York Ave. 48 Spruce St., Frencis S. N. J.
Trenton S. N. J.
Montesuma Bearing Co., 1413 First St., N. W., Albuquerque, N. M.
Vance Supply Co., Parmington, N. M.
Vance Supply Co., 211 8, Grimes St., Hobbs, N. M.

Syracuse Bearing Southern Tier Corp., 5 Jarvis St., Binghamton, N. Y. Balanrol Corp. 313 Niagara St., Buffalo 1. N. Y. Webb, J. A., Belting Co., Inc., 92 Pearl St., Buffalo 2, N. Y.

Syracuse Bearing Corp., 2275 Fillmore Ave., Buffalo 14, N. Y.

Syracuse Bearing Jamestown Corp., 821 E. 2nd Mr., Jamestown, N. Y.

Jameica, S. N. Y.

Hansen & Yorke Co., 128-72 Queens Bird., Jameica 25, N. Y.

Hansen & Yorke Co., Inc., 90 Warren St., New York 7, N. Y.

Syracuse Bearing Corp., 2993 Pine Ave., Ni-agara Falls, N. Y.

Cross Brothers Co., Inc., 112-114 Mill St., Rochester 1, N. Y.

Syracuse Bearing Rochester Corp., 159 Comfort St., Rochester 1, N. Y.

Bearing, T. T. Co., Inc., 454 Court St., Rochester St., Rochester Corp., 159 Comfort St., Rochester N. Y.

Bearing, T. T. Co., Inc., 454 Court St., Rochester Corp., 159 Comfort St., Rochester Corp., 159 Comfort St., Rochester Corp., 150 Comfort St., Rochester N. Y.

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St., Ultes 2, N. Ties Corp., 1407 Oriskany
St., West, Ultes 4, N. Y.
Tidewater Supply Co., Inc., 95 Roberts St.,
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Dille Bearings, Inc., 1621 N. Tryon St., Charlotte 6, N. C.
Mathews-Morrie Sales Co., 301 E. 7th St., Charlotte 6, N. C.
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N. C.
Dillon Supply Co., 231 E. Washington St.,
Greensboro, N. C.
Dillon Supply Co., 2035 N. William St., GoldsDillos Supply Co., 2035 N. William St., GoldsDillos Supply Co., 2035 N. William St.,
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Gereensboro, N. C.
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Bearings, Inc., 913 Ninth St., S. W., Canton
4, Ohio
Mahoning Valley Supply Co., 2401 Shepler
Church Ed., Canton 6, Ohio
14, Ohio
14, Ohio
Cincinnati Engine & Parts Co., 2863 Stanton
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Detroit Ball Bearing Co. of Ohio, 325-327 10th
St., Toledo 2, Ohio
Ohio Betting & Transmission Co., 320 N. Westwood Ave., Toledo 7, Ohio
Bearings, Inc., 2007 South Ave., Youngstown 2. Ohio Mahoning Valley Supply Co., 704 Youngstown-Poland Rd., Youngstown 12, Ohio Bearings, Inc., 738 Linden Ave., Zanesville. Ohio
onsolidated Supply Co., P. O. Box 367, Picher. Consonance Supply Co. 1. O. Box 30; Ficher.

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Materials Handling, Ltd., 4450 E. Admiral
Place, Tulsa 15, Obla.

Coos Bay Supply Co., 1223 S. Broadway, Coos
Bay, Ore.
American Steel & Supply Co., 51 E. 7th St.,

Fire.

Rametican Feel E., Co. of Ore., 600 Spring St.,

Klamath Falla, Ore.

American Steel & Supply Medford Inc., 703 S.

Graps St., Medford, Ore.

Davis, A. W., Supply Co., Box 676, Pendleton,

Ore.

Brezee Supply Co., 227 S. W. Front Ave., Ore. rezee Supply Co., 237 S. W. Front Ave., Portland 4, Ore. Portland 4, Ore.

Power Transmission Products, Div. of Portland Iron Works, 1197 N. W. 14th Ave., Portland, Ore.

Douglas Supply Co., 649 N. E. Rose St., P. O. Box 669, Roseburg 1, Ore.

Stevens Equip. Co., Supply Div., 110 Division St., Salem, Ore. Surflan Rd., Erie, Pa. Rearings, Be., 362 Poplar St., Johnstown, Ps.

A-C Supply Co. of Philadelphia, 1330 Federal St., Philadelphia 47, Pa. Bearings, Inc., 1607 W. Hunting Park Ave., Philadelphia 49, Pa. Pruya Bearings Co., 685 N. Broad St., Phila-delphia 23, Pa. Bearings, Inc., 5528 Baum Blvd., Pittsburgh 32, Pa. 32, Pa.
Jonial Supply Co., 217 Fort Pitt Blvd., Pitts-burgh 22, Pa.
Jimes Metallic Co., 2336 Cedar Ave., Scranton, Pa.
Bearings, Inc., 1285 E. Princess St., York,
Holmes Metallic Co., 519 S. Main St., Will Bearings, Inc., 1285 E. Princess St., York, Ya. Holmes Metalile Co., 519 B. Main St., Wilkes-Barre, Pa. Blood Elaind gupty & Engineering Co., 150 Rivole Elaind gupty & Engineering Co., 150 Rivole Elaind gupty & Engineering Co., 150 Rivole St., Charleston, B. C., Bearings & Drives of Charleston, S. C., Bearings & Drives of Charleston, S. C., Tidewater Supply Co., Inc., 807-811 Gervals St., P. O. Box 1138, Columbia I. S. C. Dixie Bearings, Inc., 407 Pend.eton St., Green Ville, S. C., Greenville Textile Supply Co., 594 Rhett St., Chattanoogs S., Tenn. Dixie Bearings, Inc., 2596 S. Broad St., Chattanoogs S., Tenn. Mills & Lupton Supply Co., 749 E. 12th St., Chattanoogs Z., Tenn. Dixie Bearings, Inc., 130 Clay St., Kingsport, Tenn. Tenn.
Silp-Not Belting Corp., 432-448 E. Main St.,
Box 109, Kingsport, Tenn.
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Tidewater Supply Co., Inc., 1506 Island Home
Ave., S. E., P. O. Box 377, Knoxville 7. 16. Tenn.
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Industrial Supplies, Inc., Poplar Ave. & River Front, P. O. Box 38, Memphis 1, Tenn.
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Moore-Handley, 492-498 Craighead St. and L. & N. R. B. Co., Nashville, Tenn.
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Sam Antonio Machine 1, Texas
Seymour Bearing Co., 501 E. 3rd St., Amarillo, Texas
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Logicol Bearing Service, 613 Trinity St., Austin. Texas
Dependable Motor Parts, 1913 7th St., Bay
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Johnston Bearing & Supply Co., 2855 College
St., Beaumont, Texas
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Burton Bearing & Industrial, Inc., 1344 E.
Burton Bearing & Industrial, Inc., 1344 E. St., Beaumon, Seymour Bearing Co., 905 N. Cedar, Seymour Bearing Co., 905 N. Cedar, Texas
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Mideap Bearing Service, 4624 Baldwin, Corpus
Christi, Texas
San Antonio Machine & Supply Co., Savage
Lane, P. O. Box 971, Corpus Christi, Texas
Cottingham Bearings & Service, 7322 Harry
Line 19, Texas Adams St., Downstrie, 4624 Baldwin, Corpus Mideap Bearing Service, 4624 Baldwin, Corpus Mideap Bearing Structure, 2012 August Carpenter Bearing Co., 1308 W. 2nd St., Odesas, Texas Vance Supply Co., 115 E. First St., Odesas, Texas Johnston Bearing & Supply Co., 701 Seventh St., Port Arthur, Texas Burley, Co., 701 Seventh Raymondville, Texas & Supply Co., 230 N. Chadbourne St., San Angelo, Texas Mideap Bearing Sevice, 603-605 Main Ave., San Antonio S., Texas Supply, 325 N. Center San Antonio Machine & Supply, 25 N. Center San Antonio Machine & Supply Co., 26 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto Supply Inc., 525 E. Highway, Weslaco, Texas Burton Auto, 130 Indiana Ave., P. O. Box 600, Sait Lake City 10, Utah McCraw, James, Inc., Commerce at Third St., Fron Royal, V. Gomerce at Co., Inc., 501-535 W. 24th St., Fron Royal, V. Gomerce at Co., Inc., 501-535 W. 24th St va.
Tidewater Supply Co., Inc., 501-535 W. 24th
St., P. O. Box 839, Norfolk I, Va.
McCraw, James, Inc., 9th & Cary Sts., Richmond IT, Va.

Tidewater Supply Co., Inc., 12th & Byrd Sts.,
Richmond 19, Va., Inc., Shenandoah at 14th
St., Boanoke S., Va.
Grays-Hardor Equip. Co., 419 S. "F" St.,
Aberdeen, Wash.
Everett Transmission & Rubber Co., 1166 Hewitt Ave., Everett, Wash.
Lamb-Grays Harbor Co., Ice., Blaine & Firman
Sts., Hoquiam, Wash.
Bearing Engineering & Supply Co., 65 Horten
Cartor-Miller Mill Furnishing Co., N. 1324
Ash St., Spokane, Wash.
Drumheller Co., 1 W. Alder St., Walla Walla,
Wash. Ash St., Spokane, wash.
Drumbeller Co., 1 W. Alder St., Walla Walla,
Wash.
Wells & Wade Hardware, 201 S. Wenatchee,
Are, Wenatchee, Wash.
St. Sirist St., Yakima. Wash.
Bluefield Supply Co., Princeton Ave. at Mercer
St., Bluefield, W. V.
Bearings, Inc., 1516 Ennawha Bird., West.,
Charleston 2, W. V.
Pennsylvania & West Virginia Supply Corp.,
Elm Grove, W. Va.
Bearings, Inc., 2761 Fifth Ave., Huntington,
W. Va. Pennsylvania & West virginia Suppy Corp., Elm Grove, W. Va.
Bowvings, Inc., 2761 Fifth Ave., Huntington, Logan Hardware & Supply Co., Inc., 18th St., West & Adams Ave., Huntington, W. Va., Logan Hardware & Supply Co., Inc., 206 Highland Ave., Logan, W. Va., 1961,

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Denver, Colo.
Liu. 124 LaSalle Bd., West Hartford, Conn.
Baker Engrg. & Equip. Co., 395 Pattle Ave., Wichita, Kan. Mervill, Melville L., 128 Lassais au., 128 Hartford, Conn. Baker Engrg. & Equip. Co., 305 Pattie Ave., Wichita, Kan., 19. Co., 306 E. Main St., Orr Safety Europe. Co., 306 E. Main St., 2012 Leonidas St., New Orleans, La. Phipps Machinery Co., 1237 Highland Ave., Needham 92, Mass., Wing & Jabany, 2635 E. Division Ave., Grand Rapids 7, Mich. Co., 2438 Franklin Ave., St., Paul 14, Minn. Meredith Machinery Co., P. O. Box 749, Englewood, N. J. Marshall, Geo. A., Machy., P. O. 9083, Charlotte, N. J. Marshall, Geo. A., Machy., P. O. 9083, Charlotte, N. L. Marshall, Geo. A., Machy., P. O. 9083, Charlotte, N. J. Marshall, Geo. A., Machy., P. O. 586, Far Hill Han, Louis C., 53 Long Lane, Upper Darby, Pa. Nask Machy. Co., 2508 N. Broad St., Phil-Pa. Nast Machy. Co., 2508 N. Broad St., Phil-D D. Nast Michy. Co., 2008 N. Broad St., Phil-adelphia, Pa. R., Inc., 2414 W. Liberty Ave., Pittaburgh 28, Pa. Southwest Air Equip. Co., P. O. Box 954, Fort Worth. Tesn. Knoxville, Tenn. St. St. St. St. Seattle Jefferis & Moore, Inc., 3416 Chesterfield Ave., Charleston, W. Va.

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Lowery Brothers, Inc. 9332 Anthony Ave., Chicago 17, Ill.

Lummis Mfg. Co., 210 2242 E. Foothill, Pasadena, Calif.

Luxo Lamp Corp. Dock St., Port Chester, N. Y. BRANCH OFFICES:

464 Bryant St., San Francisco, Calif.

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Macchi & Co. 819 Valencia St., San Francisco 10, Calif.

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Trio Sales Co., 2520 E. Washington Bird., Les Angeles, Calif.
L. Feldman & Co., 2530 B. Michigan Are., Chicago, Ill.
Vehicle Parts Warchouse, 635 W. 55th St., New York, N. Tracey & Co., 937 N. W. Glisan, Portland, Ore. Western Automotive, Inc., 1512 11th Ave., Seattle, Wash.

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144 Thalia St., New Orleans 3, La.
75 Oakman Bivd., Detroit 8, Mich.
2356 Hampden Ave., St. Paul 14, Minn.
35 Water St., New Tork City 4, N. Y.
1603 N. W. 14th Ave., Portland 9, Ora.
235 Curry Hollow Rd., Pittsburgh 56, Pa.
7 L. T. Terminal Wines., Even Worth 1, Texas
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Elm Equip. Co., 256 N. Wash. Are., P. O. Box 1191, Mobile, Ala.

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Toy Bursa Co., 2015 Lewis St., P. O. Bex 7, A. A. Station, Little Rock, Ark.

All Bearing Salee & Service Co., 602 Fulton St., Freeno, Calif.

Biliard, W. T., Inc., 734 E. 3rd St., Loe Angeles, Calif. & Supply Co., 1317 Willow St., General Equipment Co., 110 Freeway Bird., South San Francisco, Calif.

Winn Supply Co., 1676 Main St., P. O. Box 1709, San Diego, Calif.

Yale & Towne Mfs. Co., 5711 Olympic Bird., Los Angeles, Calif. Tools Supply Co., 1517 Willow St., Common Equipment Co., 518 March St., P. O. Box 1709, San Diego, Calif.

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Colo.
Industrial Trucks, 66 Boston Pest Rd., Milford.
Coan.
Rev. Colo.
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Rev. Colo.
Ros. 2345, Letchonville, Fla.
Ros. 2345, Letchonville, Fla.
Ros. 2346, Letchonville, Ros.
Ros. 2346, Ros.
Ros. 2346

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Hall, Gransden, & Co., 920 Walnut 8t., Flint, Mich.
Mich.
Sehnder, P. J., 1619 Hanchett 8t., Saginaw, Mich.
Nottapelli, Minn.
Hutchesen, L. O., & Associates, 6219 E. Irth 8t., P. O. Box 6222, Centrepolis Sta., Kansas City, Me.
Massey Equip. Co., 1011 Woodbine Dr., St. Louis 19, Me.
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Whale Auto Parts, 1911 Atlantic Avo., Atlantic
City, N. J.

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Ufert Auto Parts Service, Inc., 15-25 Barnes
St., Trenton S, N. J.
Pruden, W. E., Co., Inc., 100 Ist St., Hackensack, N. J.
Labr Distr., 2005 Hudson Bird., Jersey City.
N. J. Lebr Distr., 3209 Hudson Bivo., Jersey City. N. J.

N. J.

Clinton Square Auto Supply, 28 Washington St., Morristown, N. J.

Sto., Morristown, N. J.

Sto., Morristown, N. J.

Clinton Square Auto Parts Corp., 83 Sanford St., New Brunswick, N. J.

Pound Brothers Automotive Supply Co., 412 Marble Ave., N. W., Albuquerque, N. M.

Detroit Supply Co., Inc., 78-80 Central Ave., Albany, N. W.

Perreault Auto Parts Inc., 63 River St., Troy, N. Y.

Onondaga Supply Co., Inc., 41 Garden St., N. Y.
Onondaga Supply Co., Inc., 41 Garden St.,
Auburn, N. Y.
Rose Unit Parts Corp., 44 Wall St., Binghampton, N. Y.
Strauss, Jos., Co., Inc., 25 High St., Buffalo,
N. Y. N. Y.
Whipple's Automotive Equip., 364 State St.,
Elmira, N. Y.
Defroit Supply Co., Inc., 45 Ridge St., Glens
Falls, N. Y.
Genessee Supply Co., Inc., 53-55 Main St., N. Y. Supply Co., Inc., 53-55 Main St., sville, N. Y. Auto Supply, 58 Broadway, Hornell, Cramer's Auto Parts, 619 W. State St., Ithica, N. Y.
C. M. K. Auto Parts Corp., 303 Lafayette St.,
Jamestown, N. Y.
Detroit Supply Co., Inc., 791 Broadway, Kingston N. ton, N. Y. Kimball, S. G., 125 Washington St., Newburgh, N. Y. Kimball, S. G., 125 Washington St., Newburgh, Capco Standard Parta Inc., 518 W. Sullivan St., Olean, N. Y.
Plattaburg Motor Service Inc., 95 Bridge St., Plattaburg, N. Y.
Pruden, W. E., Co., Inc., 354 Mill St., Pough, Keepsis, N. K.
Reepsis, N. T.
Reachester 19, N. Y.
Plattaburg Motor Service of Saranac Lake, Inc., Saranac Lake, N. Y.
Leach Products Inc., 1012 State St., Schenectady, N. Y.
Roynouse, N. T.
Reynouse, N. T.
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Republic Auto Parts Co., 260 W. 52nd St., New York 19, N. Y.
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Republic Auto Parts Co., 27 Westchester Ave., Bronx, N. Y.
Republic Michine Works Inc., 268 N. FrankBronx, N. Y.
Republic Motor Equip, Co., 900 Fulton St.,
Vevercady Motor Equip, Co., 900 Fulton St., Ilin St., Hempstead, N. Y.
Official Distr. Corp., 2227 Westchester Ave.,
Brons, N. Y.
Eveready Motor Equip. Co., 900 Fulton St.,
Brookkyn, N. Y. Bready Motor Equip. Co., 900 Fulton St., Persondy Motor Equip. Co., 900 Fulton St., Persondy N. Y.

Reiner Machinery Corp., 42-01 Northern Bird., Long Island City, N. Y.

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Motor Bearings & Parts Co., Of Equativalle, N. C.

Motor Bearings & Farts Co., St., Constance, N. C.

Motor Bearings & Parts of Greensboro, N. C.

Motor Bearings & Parts of Greensboro, N. C.

Motor Bearings & Parts Co., Dabney & Garnett Sts., Henderson, N. C.

Hickory Auto Parts Inc., 738 1st Ave., N.W., Hickory, N. C.

Kinston Auto Parts Co., 110 W. Gordon St., Kinston, N. C.

Motor Bearings & Parts Co. of Raleigh Inc., 223 S. Main St., Rocky Mount, Inc., 223 S. Main St., Rocky Mount, N. C.

Plowers Co., 213 S. Meeting St., Statesville, N. C.

Paul's Auto Supply Co., 105 N. Repass St., Provers Co., 213 S. Meeting St., Statesville, N. C.
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Sandusky Parts Ca., Inc., 424 Huron Ave.,
Sandusky, Ohio
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Bell. Ohls.
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Standard Parts Co., 818 S. Detroit St., Tulsa Standard Parts Co., 818 S. Detroit St., Tulsa Standard Parts Co., 818 S. Detroit St., Tulsa Co., 10 St., 200 Ass. Standard Parts Co., 816 S., V. 19th Avs., Pert-land, Ore., Pertland, Ore., Pertland, Ore., Pertland, Ore., VIS Allen St., Allentown, Ps. Automotive Supply Co., 1917 Margaret Avs., Automotive Supply Co., 1917 Margaret Ave., Altoona, Pa.
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Harrisburg Auto Parts, 170 N. 2nd, Chambers burg, Pa.
Miller Auto Parts, 23 N. 2nd St., Clearfield, Pa.
Auto Parts Co., Inc., 236 W. Long Ave., Du-Bois, Pa.
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Auto Parts Co., Inc., 539 E. Mahoning St., Punxsutawnsy, Pa.
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Craig Motor Service, 286 E. Fayette St., Union-Pa. Auto Parts Co., 128 S. 2nd St., Sun-Curia Motor Service, 286 E. Fayette St., Union-town, Pa.
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Ohio Valley Battery & Ignition Co., 238 W.
Chestnut St., Washington, Fa.
K. & K. Auto Parts Co., Inc., 283 S. Main St.,
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Automotive Supply Co., 243 W. 2rd St., WillHilamsport, Pa.
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Michael St., St., 19 Long Wharf St.,
Co., 19 Long Wharf St.,
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Charleston, S. C. Manna-Hoffman Supply Co., Inc., 85 Geo. M. Cohan Memorial Bird., Providence, B. I. Charleston Automotive Parts Inc., 63 Hasell St., Charleston & Co., 200 Buncombe St., Greenville, S. C. Greenville, S. C. Soy. Buncombe St., Spartan Automotive Inc., 300 W. Main St., Spartansburg, S. C. Anderson Auto Parts, 505 S. Main St., Anderson Auto Parts, 508 S. Main St., Columbia, S. C. Standard Parts Co., 1800 Blanding St., Columbia, S. C. Standard Parts Co., 1800 Blanding St., Columbia, S. C. Standard Parts Co., 1800 Blanding St., Columbia, S. C. Standard Parts Co., 1800 Blanding St., Columbia, S. C. Standard Parts Co., 1800 S. Dakota Are, Sloux Fails, S. D. Lawler St., Michell, S. D. Lawler St., Showlis, Tenn. Service Auto Parts Co., Emory Park & Central St., Knowlie, Tenn. M. M. St., Showlie, Tenn. M. Torris Co., 171 Dudley St., Memphis, Teth-Sinclaft Co., Inc., 1141 Broadway, Nash-St. H. Showland Co., 1811 Broadway, Nash-St. Tenn. Keith-Sinclair Co., Inc., 1141 Broadway, Nash-ville 2, Tenn. ville 2, Tenn.
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812 Olive St., St. Louis 1, Mo.
812 Olive St., St. Louis 1, Mo.
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814 Olive St., St. Louis 1, Mo.
815 Olive St., St. Louis 1, Mo.
815 Olive St., St., Tania City 12, Mo.
816 E. 4th St., Chariotic, N. C.
2249 Losantiville Rd., Cincinnati 13, Ohio
1826 E. 4th St., Tulisa 29, Okia.
1836 Euclid Ave., Eu. 421, Cleveland 15, Ohio
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1836 Caus Linta Plass, Dalias 18, Texas
1837 M. Holcombo, Houston 25, Texas
1837 M. Holcombo, Houston 25, Texas
1837 M. Holcombo, Houston 25, Texas
1838 Caus Linta Plass, Dalias 18, Texas
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Holden Co., Ltd., 614 St. Janes St. West.
Mentreal, Gus., Canada
Linzer, Alfred E., Co., Inc., 1507 Kapicani
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P. O. Box 390, Newark 12, N. J.
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Queens Optical, Industrial Div. . . . . . 130 4707 Montgomery Rd., Norwood, Ohio

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Rainfair, Inc. 1501 Albert St., Racine, Wis. BRANCH OFFICES:

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Ready Made Sign Co., Inc. 262 115 Worth St., New York, N.Y.

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Reliance Steel Products Co. 3800 Walnut St., McKeesport, Pa. BRANCH OFFICES: 250 E. 43rd Ss., New York 17, N. Y. 1700 Walnut 8t., Philadelphia 3, Pa.

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Yankee Engineering Ca., 3500 Washington Bird., Baltimore, Mf.
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Prseman, Chas. B., Co., 1660 Kenmore Avc., Burfalo 23, N. Y., Great Lakee Splicing & Supply, 22570 Lakeland Bird., Burfalo 23, N. Y., Great Lakee Splicing & Supply, 22570 Lakeland Bird., Brootlyn, Pa.
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# Rochester Safety Equip. Co., Inc. 209 83-85 Howell St., Rochester 7, N. Y.

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Grady, James M., Company, 918-15 W. Adams
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Neb.
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Dierekx, Julies, Distributors, Inc., 79 Dunne St.,
Copper, Charles B., Material Handling Specialties, 335 Kensington Bd., Syracuse, N. Y.
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York, N. Y.
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McDonald, W. L., P. O. Bex 2107, Greensboro, N. C.
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Coroll Equip. & Supply Co., 287 Forest Lawn
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Fa. J., Son., 2 Cralio Ave., Pittsburgh,
Fa. Stokes Equipment Co., 10 W. Mt. Airy Ave.,
Philadelphia, Fa.
Stokes Equipment Co., 10th and Cherry Bts.,
Philadelphia, Pa.
L., Son., 20th and Cherry Bts.,
Philadelphia, Pa.
L., Son., 20th and Cherry Bts.,
Philadelphia, Pa.
L., 1 Materials Handling Co., 122 S. Cameron
St., Harrisburg, Pa.
L. 1 Industrial Equipment, 1202 Frankford Ave.,
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Douler Equipment Fa.
Douler Equipment Fa.
Douler Squipment Fa.
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Douler Squipment Sc., 1538 Demombreum St.,
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Sinclair Sales Co., Inc., Number 1 Main St.,
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Douler Squipment Sc., 1588 Demombreum St.,
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Spracuse Supply Co., P. O. Box 1646, Syracuse Supply Co., Cert.
Nyracuse-Elbridge Co., Inc., 1168 Spring St., Syracuse Supply Co., P. O. Bex 1044, Syracuse, N. Y.

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Syracuse, N. Y.

Tray Belting & Supply Co., 6 & 8 Grand St.,

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A. Co., 1820 W. Fifth Ave.,

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Dayton Safety Supply Co., 11 Longworth St.,

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Kinsey, E. A., Co., Inc., 18 Washington St.,

Dayton, Ohio

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Orla.
Kriaman Industrial Supply, 308 E. Fourth Ave.,
P. O. Box 1319, Tulas. Orla.
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Portland, Ore.
Sanderon Safety Supply Co., Inc., 816 S. E.
Hawthorne Bird., Portland 14, Ore.
Hawthorne Bird., Portland 14, Ore.
Hawthorne Bird., Portland 14, Ore.
Hawthorne Bird., Portland 16, Ore.
Hawthorne Bird., National Mine Service Co.,
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Safety First Supply Co., 425 Magee St., Pitts-burgh, Pa.
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Scranton, Pa.
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Hawthorne, Pa., Philadelphila, Philadelphil San Antonio Machine & Supply, Corpus Christi, Tex. Tex.

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San Antonio Mach. & Supply, 325 N. Center St.,

San Antonio Mach. & Supply, P. O. Bex 148,

Waco, Texas

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1949 Lafayette St., New Orleans, La.

467 Montgomery St., Shreveport, La.

1745 W. LaFayette St., Detroit, Mich.

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940 Hertel Ave., Buffalo, N. Y.

1021 Depot St., Cincinnati, Ohio

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940 Hertel Ave., Buffalo, N. Y.

1021 Depot St., Cincinnati, Ohio

2006 Mashington Bl., Portland, Ore.

150 N. Watte St., Philadelphia, Pa.

1504 Washington Blyd., Pittsburnh, Ps.

151 N. 5th St., Abliene, Texas

1637 Andrew Highway, Odesse, Texas

257 K. Georgia Ave., Memphis, Tenn.

1104 Main St., Charlesten, W. Va.

Witt Cornice Co. 4454 Steel Place, Cincinnati 9, Ohio

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Wolverine Shoe & Tanning Corp. Rockford, Mich.

Worklon, Inc. 147 253 W. 28th St., New York 1, N. Y.

Worrell-Consolidated Laboratories, Inc. 1470 S. Vandeventer Ave., St. Louis 10, Mo.

Wyandotte Chemicals Corp. . . . . . 30-31 J. B. Ford Div., Wyandotte, Mich.

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Div, et Union Carbide Corp.
Minnesota Minning & Mfg. Co.
National Mine Service Co.
Pangborn Corp.
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Flooring Materials, Safety
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Borden Metal Prod. Co.
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Federal Flooring Corp.
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Fulton Asphalt Co.
Globe Co.,
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Boyer-Campbell Co.
Fulton Asphalt Co.
Globe Co.,
Fulton Asphalt Co.
Horn, A. C., Co.,
Bub. & Div. of Sun Chemical Corp.
Inland Steel Co.
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Legge, Walter G., Co., Inc.
Magnetium Co. of America
Masnity-Toung Co.
Mannesota Mining & Mg. Co.
Mining Froducts Co., Inc.
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Mining Froducts Co.
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Mining Legge Co.
United Laboratories, Inc.
United States Rubber Co.
Floor Plate. Abrasive

## Floor Plate, Abrasive

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Industrial Products Co. New Jersey Safety Equip. Co.

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Hewson Co., Inc. United States Radium Corp.

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National Mine Service Co. Pyle-National Co. Swivelier Co., Inc. Traffic Equip. Co.

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Boyer-Campbell Co.
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Brussard, Lester L., Co.
Brussard, Lester L., Co.
Horn, A. C., Co.,
Sub, & Div. of Sun Chemical Corp.
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Brabrook, A. N., Inc.
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Industrial Products Co.
Industrial Products Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Scientific Media Products Inc.
Singler, M. L., & Son, Inc.
Superior Rubber Mfg. Co.

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Brosard, Lester L., Co.
General Scientific Equip. Co.
Industrial Products Co.
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Safety First Supply Co., Sarjeant Metal Products Inc.
Silver, Fred. & Co.
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Bub., When Co., Co.,
However, Co., Inc.
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Stair Treads, Safety

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Moor, D. W., Co.
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See directory of Safety Equipment Sources for addresses.

(section 2-continued)

New Jersey Safety Equip. Co. Protectoseal Co.

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Huntington Laboratories, Inc.
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Kent Co., Lo. & Son, Inc.
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National Disinfectant Co.
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Hild Floor Machine Co., Inc.

Handling Devices Co., Inc.

Holt Mfg. Co.

Homestead Valve Mfg. Co.

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## Compounds, Sweeping

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Majestic Wax Co.
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Penetone Co.
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Hollingshead, R. M., Corp.
Huntington Laboratories, Inc.
Packwood, G. H., Mfg. Co.
Penetone Co.
Practical Mfg. Co.
Tect, Inc.

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## Floor Finishing Compounds

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Finnell System, Inc.
Finishing Co.
Hillyard Chemical Co.
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Hillyard Chemical Co.
Horn, A. C., Co.,
Sub. & Div. of Sun Chemical Corp.
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Sub. & Div. of Sun Chemical Corp.
Huntington Laboratories, Inc.
Johnson, B. C., & Son, Inc.
Legge, Walter G., Co., Inc.
Mattery Councy Co.
Rattery Council Co.
Rochester Germiedde Co.

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Aluminum Bafety Prod. Inc.
American Mason Safety Treed Co.
American Optical Co.
Cleveland Ladder Co.
Industrial Products Co.
Industrial Products Co.
Industrial Products Co.
Mimb Bafety Appliances Co.
New Jersey Safety Equip. Co.
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Inc.
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Inc.
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Weitner, M. D., Co., Inc.
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Aluminum Ladder Co.
Aluminum Safety Prod. Inc.
American LaFrance,
Dir. of Sterling Precision Corp.
Dir. of Sterling Precision Corp.
Dir. of Sterling Precision Corp.
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Duo-Safety Ladder Corp.
Industrial Products Co.
National Mine Service Co.
Patent Scaffolding Co., Inc.
Patent Scaffolding Co., Inc.
Pulmosan Safety Equip. Corp.
Putnam Rolling Ladder Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Up-Right Scaffold
Werner, B. D., Co., Inc.

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Ballymore Co.
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Cotternan, I. D.
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Fisher Scientific Co.
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Rol-Away Truck Mfg. Co., Inc.
Safety First Supply Co.
Up-Right Scaffolds
Werner, R. D., Co., Inm.

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Aluminum Ladder Co., Inc.
Aluminum Safety Prod., Inc.
American Allaafe Co., Inc.
Babcock, W. W., Co.
Cleveland Ladder Co.
Duc-Safety Ladder Copp.
Ladder

## Ladders, Safety

## Ladders, Tower Safety

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Aluminum Safety Prod., Inc.
Industrial Product Co.
Nichols Engineering Co.
Patent Scaffolding Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety Tower Ladder Co.
Truck Equip. Co.
Up-Right Seaffolds
Werner, R. D., Co., Ins.

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Meyer Machine. Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety Tower Ladder Co.

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Aluminum Safety Pred., Inc. Ballymore Co. Bil-Jax, Inc. Bil-Jax, Inc. Economy Engineering Co. Economy Engineering Corp. Patent Scaffolding Co., Inc. Truck Equip. Co. Werner. B. D., Co., Inc.

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## Mop Truck

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## Nets, Rope Safety

Bullard, E. D. Co. Gentex Corp. Industrial Producta Co. Rose Mfg. Co. Safety First Supply Co.

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Areo Compant, E. I. de Nemours & Co., Inc.
Frost Faint & Oil Corp.
Horn, A. C., Co.,
Seb. & Div. of Jun Chemical Corp.
Kelley Faint Co.,
Kelley Faint Co.,
Fitchung Frist Glass Co.
Hadiant Color Co.

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Kelley Paint Co.

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Aluminum Safety Prod., Inc.
Beaver-Advance Corp.
Bil-Jax, Inc.
Cleveland Ladder Co.
Duo-Safety Ladder Corp.
Industrial Products Co.
Patent Senfloiding Co., Inc.
Safety First Supply Co.
Up-Right Beaffolds
Werner, R. D., Co., Inc.

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## Pole Grip, Safety

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## Safety Device, Tower Ladder

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Bil-Jax, Inc.
Patent Scaffolding Co., Inc.
Safety First Supply Co.
Up-Right Scaffolds

## Scaffolding, Rolling

Aluminum Safety Prod., Inc. Beaver-Advance Corp. Bil-Jax, Inc. Patent Scaffolding Co., Inc. Up-Right Scaffolds Werner, R. D., Co., Inc.

## Scaffolding, Safety

Aluminum Safety Prod., Inc.
Beaver-Advance Corp.
Bil-Jax, Inc.
Patent Sauffelding Co., Inc.
Safety First Supply Co.
Up-Right Seaffolds
Werner, R. D., Co., Inc.

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(section 2—continued)

## Scrubbing Machines, Floor

Crusbung Macranes, Floor
Clarks Floor Machine Co,
Doyle Vacuum Cleaner Co,
Pinnell System, Inc.
Hillyard Chemical Co.
Hillyard Chemical Co.
Huntington Laboratories, Inc.
Johnson, S. C., & Son, Inc.
Masury-Young Co.
National Disinfectant Co.

## Stain Removers, Floor

Hain McEMOVETS, FLOOF
Bruiln & Ca., Inc.
Hollingshead, B. M., Corp.
Horison Industries
Huntington Laboratories, Inc.
Johnson, S. C., & Son, Inc.
Leggs, Walter G., Co., Inc.
Multi-Clean Products, Inc.
Oakite Products, Inc.
Worrell-Consolidated Laboratories, Inc.

## Sterilizers, Can Washers

Vacuum Can Co.

## Sterilizing Equipment

Fisher Scientific Co. Karel First Ald Supply Co.

## Sweepers, Road and Parking Lots

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## Swing Stages

Aluminum Safety Prod., Inc.
Baboock, W. W., Co.
Cleveland Ladder Co.
Patent Scaffolding Co., Inc.
Safety First Supply Co.
Werner, B. D., Co., Inc.

## Trestles, Extension

Bahcock, W. W., Co. Beaver-Advance Corp. Bli-Jax, Inc. Cleveland Ladder Co. Cleveland Ladder Co., Inc. Putnam Bolling Ladder Co., Inc. Sefety First Supply Co.

## Vacuum Cleaners, Explosion-Proof

Doyle Vacuum Cleaner Co.
Hild Floor Machine Co., Inc.
Invincible Vacuum Cleaner Mfg. Co.
Mc Mc A., Inc.
Multi-Clean Products, Inc.
Symptomic Co.
Worrell-Consolidated Laboratories, Inc.

## Vacuum Cleaners, Industrial

Vacuum Cleaners, Industrial
Brulin & Co., Inc.
Claside Floor Machine Co.
Claside Floor Machine Co.
Claside Floor Machine Co.
Claside Floor Machine Co.
Floor Machine Co.
Floor Machine Co., Inc.
Hild Floor Machine Co., Inc.
Hillyard Chemical Co.
Holt Mig. Co.
Holt Mig. Co.
Holt Mig. Co.
Holt Laboratories. Inc.
Louis Classer Mig. Co.
Mansury-Young Co.
Masury-Koung Co.
Masury-Koung Co.
Multi-Clean Products, Inc.
National Disinfectant Co.
National Disinfectant Co.
National Disinfectant Co.
Worrell-Consolidated Laboratories, Inc.

## Vacuum Cleaners, Mercury Recovery & Fume Collection

Acme Protection Equip. Co.

Water Carriers New Jersey Safety Equip. Co., Rochester Safety Equip. Co., Inc.

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Hillyard Chemical Co.
Hillyard Chemical Co.
Horn, A. C., Co.,
Sub, & Div. of Sun Chemical Corp.
Huntington Laboratories, Inc.
Johnson, S. C., & Son, Inc.
Masury-Young Co.
Worrell-Consolidated Laboratories, Inc.

## Wax, Floors

Nax, Floors

Brulin & Co., Inc.

Finnell System, Inc.
Goodrich, B. F., Co.

Hillyard Chemical Co.

Hollingshead, R. M., Corp.

Sub. & Div. of Sun Chemical Corp.

Huntington Laboratories, Inc.

Johnson, S. C. & Soe, Inc.

Legge, Walter G., Co., Inc.

Masury-Young Co.

Multi-Clean Products Inc.

National Disinfectant Co.

Penetono Co.

Francisco Co.

Scientific Industrial Supply Co.

Vestal, Inc.

Worrell-Consolidated Laboratories, Inc.

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Institute of Industrial Launderers Scientific Industrial Supply Co.

## Workstands, Elevating, Portable and Stationary

Stationary
Bil-Jax, Inc.
Economy Engineering Co.
Hamilton Tool Co.
Up-Right Scaffolds
West Bend Equip. Corp.

# Section 3 Industrial Health Engineering

Allied Witan Co., Inc.
Coppus Engineering Corp.
DeVilbias Co.
Mine Safety Appliances Co.,
Torit Mfg. Co.
Union Industrial Equip. Corp.
Wheelabrator Corp.

## Air Pollution Control

Air Foliation Control
American Machine & Metals, Inc.,
DeBothesat Fans Div.
Buffale Forge Co.
Oxy-Catalyst, Inc.
Staplex Co., Air Bampler Div.
Stephenson Corp.
Torit Mfz. Co.
Union Industrial Equip. Corp.
Wheelsbarior Corp.

## Anemometers

Fisher Scientific Co.

## Athlete's Foot Retardant

America Enterptises, Inc.
Foam-X Co.
Huntington Laboratories, Inc.
Industrial Producta Co.
Multi-Clean Prod., Inc.
Onos, Inc.
Onos, Inc.
Onos, Esc.
Ones Co.
Feeton Co.

## Blowers, Portable, Electric

American Machine & Metals, Inc.,
DeBothesat Fans Div.
Buffalo Forge Co.
Coppus Engineering Corp.
Finnell System, Inc.,
Mine Safety Appliances Co.
Mine Safet

## Blowers Ventilating

Movers Ventilating
American Machine & Metals, Inc.,
DeBothesat Fana Div.
American Radiator & Standard Sanitary Corp.,
American Blower Div.
Buffalo Forge Co.
Coppus Engineering Corp.
Davis Emergency Equip. Co., Inc.
Ingersoil-Rand Co.
Mine Bafety Appliances Co.
Morrison-Pelsue Co.
Morrison-Products, Inc.
Riobbins & Myers, Inc.

Coppus Engineering Corp. Fisher Scientific Co.

## Cleaning Compounds or Solvents

Cleaning Compounds or Solvents
Brulin & Co., Inc.
Brulin & Co., Inc.
Diamond Alkail Co.
Dow Chemical Co.
Dow Chemical Co.
Finnell System, Inc.
Fisher Scientific Co.
Gunk Laboratories, Inc.
Hollingshead, B. M., Corp.
Homestead Valve Mfg. Co.
Horizon Industries
Horizon Industries
Horizon Houstries, Inc.
Hollingshead, B. M., Corp.
Homestead Valve Mfg. Co.
Homestead Valve Mfg. Co.
Horizon, B. C., & Son, Inc.
Legge, Walter G., Co., Inc.
Masury-Young Co.
Moore, John B., Corp.
National Disinfectant Co.
Oakite Products, Inc.
Onyx Oll & Chemical Co.
Practical Mfg. Co.
Penetons Co.
Practical Mfg. Co.
Rochester Germicide Co.
Toct, Inc.
Wyandotte Chemicals Corp.

## Deodorizing Appliances

Huntington Laboratories, Inc. Karel First Aid Supply Co. Rochester Germicide Co. West Chemical Products, Inc.

## Disinfectants and Deodorants

Disinfectants and Deodorants
Brulin & Co., Inc.
Hillyard Chemical Co.
Hollingsbead, R. M., Corp.
Horizon Industries
Funtington Laboratories, Inc.
Horizon Industries
Funtington Laboratories, Inc.
Johnson, B. C., & Son, Inc.
Karel First Aid Supply Co.
Legge, Walter G., Co., Inc.
Multi-Clean Products, Inc.
National Disinfectant Co.
Oakitte Products, Inc.
Onyx Oll & Chemical Co.
Penetone Co.
Rochester Germicide Co.
Rochester Germicide Co.
Rochester Germicide Co.
Rochester Safety Equip. Co., Inc.
Vestal, Inc. Vestal, Inc. Wyandotte Chemicala Corp.

## Dispensers, Foot Spray

Huntington Laboratories, Inc. Industrial Products Co. Karel First Aid Supply Co. Sani-Mist, Inc.

## Dispensers, Protective Ointments

Boyer-Campbell Co. Halperin, A. E., Co., Inc. Huntington Laboratories, Inc. Hygiene Besearch, Inc.

Karel First Ald Supply Co. Mine Safety Appliances Co. New Jersey Safety Equip. Co. Packwood, G. H., Mfg. Co. West Chemical Products, Inc.

## Dispensers, Salt Tablet

Dispensers, Salt Tablet
Bullard, E. D., Co.
Davis Emergency Equip. Co. Inc.
General Scientific Equip. Co.
Haws Drinking Faucet Co.
Industrial Products Co.
Karel First Aid Supply Co.
Medical Supply Co.
Medical Supply Co.
Morton Salt Co.
National Mine Service Co.
National Mine Service Co.
National Mine Service Co.
Pulmosan Safety Equip. Co.
Pulmosan Safety Equip. Co.
Pulmosan Safety Equip. Co.
Safety First Supply Co.
Sarjeant Metal Products, Inc.
Seco Safety Prod. Co.
Standard Safety Equipmant Co.
United States Safety Service Co.

## Dispensers, Soap

Dispensers, Soap
Finnell System, Inc.
Goler, Inc.
Goler, Inc.
Hillyard Chemical Co.
Huntington Laboratories, Inc.
Karol First Aid Supply Co.
Packwood, G. H., Mfg., Co.
Pochester Germicide Co.
Rochester Safety Equip. Co., Inc.
Searjeant Metal Products, Inc.
Searjeant Metal Products, Inc.
Vestal, Inc.

## Drinking Cups, Paper

Dixie Cup Div.,
American Can Co.,
Karel First Aid Supply Co.
Medical Supply Co.,
Rochester Safety Equip. Co., Inc.

## **Drinking Fountains**

Haws Drinking Faucet Co, Industrial Products Co. Karel First Aid Supply Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co. Taylor, Halsey W., Co.

## Drinking Fountains, Portable

Haws Drinking Faucet Co.
Industrial Products Co.
Karel First Aid Supply Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

(section 3-continued)

## Dryers, Electric, Safety Equipment Chicago Hardware Foundry Co. Industrial Products Co.

## Dryers, Face and Hands, Electric Chicago Hardware Foundry Co. Huntington Aboratories, Inc. Industrial Products Co.

## Dust Arresters

Devibles Co.
Majostic Wax Co.
Majostic Wax Co.
Mine Safety Appliances Co.
Pangborn Corp.
Pumeinos Co.
Ruemelin Mfg. Co.
Torit Mfg. Co.
Wheelabrator Corp.

## Dust Collectors

American Radiator & Standard Sanitary Corp.,
American Blower Div.
Craftools, Inc.
Devilbins Cop.
Pangborn Corp.
Fangborn Corp.
Rugup. Co., Inc.
Rummain Mfg. Co.
Torit Mfg. Co.
Union Industrial Equip. Corp.
Wheelabrator Corp.

## **Dust Control Systems**

Devilbis Ce.
Handling Devices Ce., Inc.
Handling Devices Ce., Inc.
Institute of Industrial Launderers
Majestic Wax Co.
Torit Mfg. Co.
Wheelabrator Corp.

### **Dust Counter**

Industrial Products Co.
Mine Safety Appliance Co.
Staplex Co., Air Sampler Div.
Union Industrial Equip. Corp.
Willson Products Div., Ray-O-Vac Co.

## **Dust Suction Equipment**

Finnell System, Inc.
Handling Devices Ce., Inc.
Mine Safety Appliances Co.
Spencer Turbine Co.
Torit Mfg. Co.
Union Industrial Equip. Corp.

## Dusters, Rock

Mine Safety Appliances Co

National Mine Service Co. Oxy-Catalyst, Inc.

## Eye Washing Fountains

Sye Washing Fountains
Benson & Associates.
General Scientific Equip. Co.
Halparin. A. E., Co., Inc.
Halparin. A. E., Co., Inc.
Halparin. A. E., Co., Inc.
Halparin. Products Co.
Karol First Aid Supply Co.
Logan Emergency Showers, Inc.
Mariand Associates
New Jersey Safety Equip. Co.
Pulmonan Safety Equip. Co., Inc.
Safety First Supply Co.
Standard Glove Co.
Taylor, Halsay W., Co.

## Fans. Exhaust

American Baldistor & Standard Sanitary Cerp.,
American Blower Div.
Buffale Forge Co.
Coppus Engineering, Corp.
DeVilbias Co.
Now Jersey Safety Equip, Co.
Robbins & Myers, Inc.
Ruemelin Mrg. Co.

## Fans, Ventilating

American Blower Div.

American Blower Div.

Buffale Forga Co.

Morrison-Pelsus Co.

Robbins & Myers, Inc.

Wasco Products, Inc.

## Filters, Air Device

Allied Witan Ce., Inc.
DeVilbiss Co.,
Mine Safety Appliances Co.
Union Industrial Equip. Corp.
Wheelabrator Corp.

## Foot Mats, Disinfecting

Huntington Laboratories, Inc. Industrial Products Co.

## Foot Mats, Skin-Toughening

Huntington Laboratories, Inc. Onex, Inc.

## **Fume Collectors**

Buffalo Forge Co.
Mine Safety Appliances Co.
Buemeiin Mfg. Co.
Torit Mfg. Co.
Union Industrial Equip. Corp.
Wheelabrator Corp.

Dow Chemical Co. Huntington Laboratories, Inc.

## **Fungicides**

Dolge, C. B., Co.
Dow Chemical Co.
Fine Organies, Inc.
Foam-X Co.
Huntington Laboratories, It
Karel First Aid Supply Co.
Oakite Products, Inc.
Rochester Germielde Co.
United States Rubber Co.

American Allsafe Co., Inc. Davis Emergency Equip. Co., Inc. Fisher Scientific Co Mine Safety Appliances Co.

### Germicides

Germicides

Brulin & Co., Inc.
Dameron Enterprises, Inc.
Dalge, C. B., Co.
Dow Chemical Co.
Fise Organica, Inc.
Huntington Laboratories, Inc.
Industrial Products Co.
Karel Pirst Aid Supply Co.,
Legge, Walter G., Co., Inc.
Multi-Clean Products, Inc.
Onyx Oil & Chemical Co.
Postolo, Inc.
Onyx Oil & Chemical Co.
Rochester Germicide Co.
Westal, Inc.
William Products Div.,
Ray-O-Vac Co.
Wyandotte Chemicals Corp.

## Hand Cream, Protective

Hand Cream, Protective
American Optical Co.
Boyer-Campbell Co.
Brossard, Lester L., Co.
Brossard, Lester L., Co.
Brossard, Lester L., Co.
Bullard, E. D., Co.
Chase Chemical Co.
Chemical Co.
Coloreral Beleatific Co.
Concernal Scientific Co.
Concernal Scientific Co.
Concernal Scientific Co.
Halperin, A. E., Co., Inc.
Huntington Laboratories, Inc.
Hygiene Research, Inc.
Hygiene Research, Inc.
Ludustrial Products Co.
Karol First Aid Supply Co.
Kimball Safety Products Co.
Mine Safety Appliancou Co.
Pulmosan Safety Equip, Co.
Pulmosan Safety Equip, Co.
Corp.
Rochester Safety Prod. Co.
Boarloant Metal Products Inc.
Standard Giore Co.
Storer, H. W., Co.
West Chemical Products, Inc.

## Heaters, Ventilating

## Herbicides

Diamond Alkali Co.
Dolge, C. B., Co.
Dow Chemical Co.
U. S. Borax & Chemical Corp.,
Pacific Coast Borax Co. Div.

## Hose, Steam

Goodall Rubber Co. Snyder, M. L., & Son, Inc. United States Bubber Co.

## Insecticides

INSCRICTIONS
Brulin & Co., Inc.
Diamond Alkali Co.,
Dolge, C. B., Co.
Dow Chemical Co.,
Finnell System, Inc.
Hollingshead, B. M., Corp.
Huntington Laboratoriee, Inc.
Interstate Precision Products Corp.,
Big Alert Div.
Johnson, S. C., & Son, Inc.
National Disinfectant Co.
United States Rubber Co.

## Lockers and Hangers for Clothing

Alan Wood Steel Co. Safety First Supply Co.

To locate Advertisements, see Advertisers' Index.

## Salt Tablets

salt Tablets

Bullard, E. D., Co.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Mine Safety Appliances
Mine Safety Appliances
Mine Safety Appliances
Morton Salt Co.
Mort

## Sand Blast Equipment

Bullard, E. D., Co.
Fibre-Metal Prod. Co.
Industrial Prod. Co.
Pangborn Cop.
Pulmosan Safety Equip. Corp.
Ruemelin Mfg. Co.
Safety First Supply Co.
United States Rubber Co.
Wheelabrator Corp.

## Shower Baths, Industrial

Logan Emergency Showers, Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Speakman Company
Superior Rubber Mrg. Co.
Wasso Products, Inc.

## Showers, Emergency

Showers, Emergency
Benson & Associates.
Bradley Washfountain Co.
General Scientific Equip. Co.
Haws Drinking Faucet Co.
Industrial Products Co.
Logan Emergency Showers, Inc.
Micriand Associates
New Jersey Bafety Equip. Corp.
Pulmocan Bafety Equip. Corp.
Rochoster Bafety Equip. Corp.
Rochoster Bafety Equip. Co.
Bafety First Supply Co.
Bafety First Supply Co.
Bafety First Supply Co.
Bajeaty First Supply Co.

## Showers, Laboratory

Pisher Scientific Co. Karel First Aid Supply Co. Muriated Associates Speakman Company

## Soaps or Cleaners, Hand

Soaps or Cleaners, Hand
Boyer-Campbell Co.
Brulin & Co., Inc.
Chemical Corp.
Dameron Entarprises, Inc.
Finnell System, Inc.
Finnell System, Inc.
Finnell System, Inc.
Finnell System, Inc.
Finnell Selentific Co.
Golor, Inc.
Hollingshead, R. M., Corp.
Huntington Laberstories, Inc.
Kalene Corp.
Karel First. And Supply Co.
Kalene Safey Appliances Co.
National Disinfectant Co.
Oakite Products, Inc.
Packwood, G. H., Mig. Co.
Functions Co.
Bushester Germichide Co.
Bushester Germichide Co.
Bushester Germichide Co.
Safety First Supply Co.
Safety First Supply Co.
Searleant Metal Products, Inc.
Secret, II. W., Co.
Toc.
Toc.
The Products Inc.
Vestal, Inc.
Vestal, Inc.
Vestal, Inc.
Vestal, Inc.
Chanalter and Safety Equip.
Co.
Labert Company Co.
Toc.
Turce Products, Inc.
Vestal, Inc.
Vestal, Inc.

## Solvents, Cleaning and Safety

iolvents, Cleaning and Safety
American Optical Co.
Anuel Chemical Co.
Bruiln & Co., Inc.
Daubert Chemical Co.
Diamond Alkail Co.
Dow Chemical Co.
Dow Chemical Co.
Dow Chemical Co.
Diamond Alkail Co.
Pins Organins, Inc.
West Pedicts, Inc.
Pown Jersey Safety Equip. Co.
Oakite Products, Inc.
Posturins Co.
Tect, Inc.
Trees Products, Inc.
West Chemical Products
West Chemical Products
West Chemical Products

## **Toilet Plunger**

Sterens-Burt Co.

(section 3—continued)

Towels, Paper

Huntington Laboratories, Inc. Bochester Safety Equip. Co., Inc. Scientific Industrial Supply Co.

Vending Machines, Sanitary Napkins Halperin, A. E., Co., Inc. Karel First Ald Supply Co. Rochester Germicide Co.

Ventilating Devices, Portable

Buffalo Forgs Co.
Coppus Engineering Corp.
Devis Emergency Equip. Co., Inc.
Mine Safety Appliances Co.
Morrison-Polsue Co.
Robbins & Myers, Inc.
Ruemelin Mfg. Co.

Ventilating Equipment

Ansul Chemical Co.
Buffalo Forge Co.
Coppus Engineering Corp.
Morrison-Pelsue Co.
Robbins & Myers, Inc.
Buemelin Mfg. Co.
Wasco Products, Inc.

Washfountains

Bradley Washfountain Co. Industrial Products Co. Rochester Safety Equip. Co., Inc. Speakman Company Standard Glove Co.

Washroom Equipment, Industrial

Bradley Washfountain Co. Chicago Hardware Foundry Co. Dameron Enterprises, Inc.

Horison Industries Onox, Inc. Packwood, G. H., Mfg. Co. Speakman Company Stevens-Burt Co.

Washstations, Waterless

Dameron Enterprises, Inc. Packwood, G. H., Mfg. Co. Quickee Products, Inc. Sugar Beet Products Co.

Water Coolers

Haws Drinking Faucet Co. Rochester Safety Equip. Co., Inc. Taylor, Halsey W., Co.

Water Coolers, Explosion Proof

Haws Drinking Faucet Co. Taylor, Halsey W., Co.

## Section 4 Noise Control

Audiometers

Ambeo Inc.
Beltone Hearing Aid Co.
Industrial Products Co.
Karel First Aid Supply Co.
Maico Electronics, Inc.
Mine Safety Appliances Co.

Audiometric Testing Rooms

Hansson, Elef, Inc.
Industrial Acoustics Co., Inc.
Karel First Aid Supply Co.
Maico Electronics, Inc.
Rysdon Products Co.,
Noise Control Div.

Blast Recorder

Geotechnical Corp.

Ear Stopples

Ear Stopples
Bullard, E. D., Co.
Bullard, E. D., Co.
Bullard, E. D., Co.
Inc.
Bullard, E. D., Co.
Inc.
Bullard, E. B., Co.
Industrial Products Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
Mine Bafety Appliances
Co.
Mine Bafety Appliances
Co.
Mine Safety Equip. Co.
Pulmosan Safety Equip. Co.
Inc.
Buchester Safety Equip. Co.
Inc.
Safety First Supply Co.
Safety Ear Protector Co.
Safety Ear Protector Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Sucarjaent Metal Products Inc.
Surgical Mechanical Research, Inc.

Hearing Aids

Ambeo Inc. Beltone Hearing Aid Co. Maico Electronics, Inc.

Hearing Protectors

American Optical Co.

Gentax Corp.
Kimball Safety Producta Co.
Maloo Electronica, Inc.
Mine Bafety Appliances Co.
New Jersey Safety Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Sagma Engineering Co.
Surgical Mechanical Research, Inc.
Willson Products Div.,
Ray-O-Vac Co.

**Industrial Sound Control** 

American Machine & Metals, Inc., DeBothezat Fans Div. DeBothezat Fans Div.
Gentex Corp.
Hansson, Elof, Inc.
Industrial Acoustics Co., Inc.
Johns-Marville Sales Corp.
Rysdon Products Co.,
Noise Control Div.
Scott, H. H., Inc.

Meter, Sound-Survey

Mine Safety Appliances Co. Scott, H. H., Inc.

Noise Control

Noise Control
Allied Witan Co., Inc.
American Machine & Metals, Inc.,
DeBotheat Fans Div.
Gentex Corp.
Hansson, Elof, Inc.,
Industrial Acoustice Co., Inc.,
Johns-Manville Sales Corp.
Osborn Mfg. Corp.
Ryddon Froducts Co.,
Ryddon Froducts Co.,
Scott, H. H., Inc.

Protectors, Ear

American Optical Co. Bullard, E. D., Co. Gentex Corp. Industrial Products Co. Karel First Aid Supply Co.

Kimball Safety Products Co.
Malco Electronics, Inc.
Mine Safety Appliance Co.
Mine Safety Appliance Co.
Rochester Safety Equip. Co.
Rochester Safety Equip. Co.
Rafety Clothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Safety Earl Safety Co.
Surger Safety Early Co.
Surgical Mechanical Research, Inc.

Sound Absorbers

Absorbers
Allied Witan Co., Inc.
Gentex Corp.
Goodall Bubber Co.
Hansson, Elof, Inc.
Industrial Acoustics Co., Inc.
Industrial Products Co.
Johns-Manville Sales Corp.
Kimball Safety Products Co.
Hysden Products Co.,
Noise Control Div.

Sound Analyzers

Mine Safety Appliances Co. Scott, H. H., Inc.

Sound Control Panels

Industrial Acoustics Co., Inc.
Johns-Manville Sales Corp.
Rysdon Products Co.,
Noise Control Div.

Sound Protectors

Sound Frotectors
American Optical Co.
Gentex Corp.
Hansson, Elof, Inc.
Industrial Products Co.
Kimbail Safety Products Co.
Fulmosan Safety Equip. Corp.
Rydon Products Co.
Notice Control
Sigma Engineering Co.

## Section 5 Personal Protection—Part 1

Anti-Fogging Compounds for Goggles

Anti-Fogging Compounds for G
Acme Protection Equip. Co.
American Optical Co.
Bausch & Lomb Optical Co.
Casusch & Lomb Optical Co.
Carboff Co.
Cycle-Fio Co.
Davis Emergency Equip. Co., Inc.
Eastern Bafety Equip. Co.
Fendail Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Huntington Laboratories, Inc.
Industrial Products Co.
Karol First Ald Supply Co.
Kimball Safety Products Co.
Mational Mine Service Co.
National Mine Service Co.
National Mine Service Co.
Pulmocan Bafety Equip. Co.
Pulmocan Bafety Equip. Co.
Fundatory Early Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Silione Paper Co. of America, Inc.
Standard Giove Co.
Willion Products Div.,
Ray-O-Vac Co.
Anti-Fogging Cloth for Glasses,

Anti-Fogging Cloth for Glasses, Windshields (Anti-Fogging Compounds)

American Optical Co. Carboff Co. Davis Emergency Equip. Co., Inc. Fendall Co. Hornik, Frederick Hygicon Rasoarch, Inc.

Industrial Products Co. Kimball Safety Products Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co. Searjeant Metal Products Inc. Standard Glove Co.

Blowers, Hose Mask

Acme Protection Equip. Co.
Bullard. E. D., Co.
Davis Emergency Equip. Co., Inc.
Industrial Products Co.
Mino Saccy Appliances Co.
Pulmanta Balances Co.
Pulmanta Balances Co.
Sefety First Supply Co.

Breathing Apparatus, Air Supplied

Breathing Apparatus, Air Sup,
Acme Protection Equip, Co.,
Chicage Eye Shield Co.,
Davis Emergency Equip. Co., Inc.
E & J Mig. Co.
Fyria and Co.,
Modical & Hospital Dept.
Industrial Products Co.,
Karel First Aid Supply Co.,
Mine Safety Appliances Co.,
Mine Safety Appliances Co.,
Mine Safety Equip. Co., Inc.,
New Jersey Safety Equip. Co.,
Fulmosan Safety Equip. Co.,
Safety First Supply Co.,
Safety Food. Co.,
Standard Glove Co.,
Standard Glove Co.,
Stephenson Corp.

Caps, Skull

Caps, Skull

Boyer-Campbell Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Industrial Gloves Co.
Industrial Gloves Co.
Industrial Froducts Co.
Kennedy-Ingalis. Inc.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Spaulding Fibre Co., Inc.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

Caps, Women's

Caps, Women's

Advance Gire Mig. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Industrial Products Co.
Kennedy-Ingalls, Inc.
Olympic Glove Co., Inc.
Plasco Safety Prod. Co.
Rochester Safety Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Selentific Industrial Supply Co.
Scientific Industrial Supply Co.
Stendard Glove Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.

See directory of Safety Equipment Sources for addresses.

(section 5-continued)

#### Cases, Spectacle, Goggle and Sun Glasses

Cases, Spectacle, Goggle and Sun Glasses

American Optical Co.
Bausch & Lomb Optical Co.
Chicago Eye Shield Co.
Dicago Eye Shield Co.
Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Case Co., Inc.
Davis Case Co., Inc.
Inc.
Davis Case Co., Inc.
Inc.
Davis Emergency Equip. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Scientific Industrial Supply Co.,
Standard Glowe Co.,
United States Safety Service Co.
Watchemoket Optical Co., Inc.
Willison Products Div.,
Ray-O-Yac Co.

## Cleaning Tissues, Goggles

Cleaning Tissues, Goggles

American Optical Co.
Carhoff Co.
Davis Emergency Equip. Co., Inc.
Dow Corning Corp.
Eastern Safety Equip. Co.
General Scientific Equip. Co.
Hornit, Frederick
Industrial Freducts Co.
Earle First, Aid Supply Co.
Earle First, Earle First, Co.
Earle First, Ederick
Inc.
New Jersey Safety Equip. Co.
Lensclean, Inc.
New Jersey Safety Equip. Co.
Safety First, Supply Co.
Experiment Mfg. Co.
Eyesight Surveys
Fendall Co.
Safety First, Supply Co.
Ray-O-vac Co.
Eyesight Surveys
Fendall Co.
Safety First, Supply Co.
Ray-O-vac Co.
Safety First, Supply Co.
Safety First, Supply Co.
Ray-O-vac Co.
Safety First, Supply Co.
Ray-

#### Cover Lens

### Dispensers, Goggle and Spectacle Cleaners

#### Eyeglass, Holder

Seron Mfg. Co.

#### Eye Shades, Non-Flammable

Bullard, E. D., Co. Dockson Corp. Bullaro, E. D., Co.
Dockson Corp.
Eastern Safety Equip. Co.
Fendail Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Glendale Optical Co., Inc.
Glendale Optical Co., Inc.
Clendale Optical Co., Inc.
Clendale Optical Co., Inc.
Safety First Supply Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Selistrom Mfg. Co.
United States Safety Service Co.
United States Safety Service Co.

#### Eye Shields

Fendall Co. Rochester Safety Equip. Co., Inc. Sellstrom Mfg. Co. Standard Glove Co.

Silicons Paper Co. of America, Inc.
Standard Glove Co.
United States Safety Service Co.
United States Safety Service Co.
United States Safety Service Co.

American Industrial Safety Equip. Co.
American Optical Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Dockson Corp.
Estatem Safety Equip. Co.
Fendall Co.
General Scientific Equip. Co.
General Scientific Corp.
Sub. of Bausch & Lomb Optical Co.
Hinball Safety Appliances Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Mine Safety Service Co.
Willison Products Do.
Safety Clothing & Equip. Co.
Safety Clothing & Equip. Co.
Safety Clothing & Equip. Co.
Secon Safety Prod. Co.
Selistrom Mfg. Co.
Selistrom Mfg. Co.
Selistrom Mfg. Co.
Mine Safety Supply Co.
Selistrom Mfg. Co

Glass, Safety

American Industrial Safety Equip. Co.
Bausch & Lomb Optical Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Dockson Corp.
Eastern Safety Equip. Co.,
Fendall Co.
Fendall Co.
General Scientific Co.
Glendale Optical Co., Inc.
Industrial Products Co.
Kimbail Safety Products Co.
Fittburgh Plate Glass Co.
Fittburgh Plate Glass Co.
Bandall Safety Products Co.
Safety First Supply Co., Inc.
Safety Florian Equip. Co., Inc.
Safety Florian Co.
Safety Florian Co.
Sandard Glove Co.
Standard Glove Co.
United States Safety Service Co.
Watchemoket Optical Co., Inc.
Welsh Mfg. Co.
Wilson Products Div.,
Ray-O-Vac Co.

### Glass, Welding Plates and Lenses

American Industrial Safety Equip. Co.
American Optical Co.
Bausch & Lomb Optical Co.
Boyer-Campbell Co.
Bullard, E. D., Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip.
Davis Emergency Equip.
Davis Emergency Equip.
Davis Emergency Equip.

Eastern Safety Equip, Co.
Fendall Co.
Fibre-Motal Prod. Co.
General Scientifis Equip. Co.
General Scientifis Equip. Co.
Glendals Optical Co., Inc.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Olympic Glove Co.
Inc.
Pulmosal Safety Equip. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Safety First Supply Co.
Safety First Supply Co.
Sellstrom Mfg. Co.
Sellstrom Mfg. Co.
Sellstrom Mfg. Co.
United States Safety Service Co.
Watchemoket Optical Co., Inc.
Welsh Mfg. Co.
William Products Div.,
Ray-O-Vac Co.

# Goggle and Spectacle Cleaners

Goggle and Spectacle Cleaner
American Optical Co.
Bausch & Lomb Optical Co.
Brossard, Lester L., Co.
Brossard, Lester L., Co.
Chicago Ere Shield Co.
Davis Emergency Equip. Co., Inc.
Dow Coming Corp.
Eastern Bafety Equip. Co., Inc.
Dow Coming Corp.
Eastern Bafety Equip. Co., Inc.
Dow Coming Corp.
Co. General Scientific Equip. Co.,
Inclustrial Product Co.
Karel First Ald Supply Co.
Karel First Ald Supply Co.
Karel First Ald Supply Co.
Lesueissar. Inc.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co., Inc.
Safety First Rouply Co.
Safety First Supply Co.
Seco Safety Part Supply Co.
Seco Safety Ford Co.
Seco Safety Ford Co.
William Co.
William Safety Service Co.
William Products Div.,
Ray-0-Vac Co.

#### Hair Guards

Hair Guards
Boyer-Campbell Co.
General Scientific Equip. Co.
Industrial Services Co.
Industrial Products Co.
Kennedy-Ingalis, Inc.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety Time Supply Co.
Second Co.
Safety Prod. Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equip. Co.

American Alisafe Co., Inc. American Industrial Safety Equip. Co. Bashlin, W. M., Co. Bayer-Campbell Co. Davis Emergency Equip. Co., Inc.

(section 5-continued)

Eastern Safety Equip. Co.
Fibre-Metal Prod. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Gentex Corp.
Industrial Products Co.
Jackson Products Co.
Jackson Products Co.
Jackson Products Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
Kannedo-Ingalls, Inc.
Kimball Safety Products Co.
National Mine Service Co.
Olympia Glove Co., Inc.
Pulmosan Safety Equip. Corp.
Record Industrial Co.
Rechester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
William Products Div.,
Ray-O-Vac Co.
Hats and Cans. Safety

Hats and Caps, Safety

Hats and Caps, Safety

American Industrial Bafety Equip. Ce.
Bashlin, W. M., Ce.
Boyer-Campbell Co.
Brousard, Lester L., Ce.
Brousard, Lester L., Ce.
Brousard, Lester L., Ce.
Chic Mald Hai Mfg. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Co.
Canceral Scientific Equip. Co.
General Scientific Equip. Co.
Holeomb Safety Garment Co.
Holeomb Safety Garment Co.
Holeomb Safety Garment Co.
Holeomb Fafety Garment Co.
Holeomb Safety Equip. Co.
Jacksen Preducts
Johns-Manyille Sales Corp.
Kennedy-Ingalis, Inc.
Mine Safety Appliances Co.
National Mine Service Co.
New Jerse Safety Equip. Co.
Olympic Glove Co., Inc.
Place Safety Prod. Co.
Pulmotan Safety Equip. Co.
Rochester Safety Equip. Co.
Safety First Supply Co.
Seen Safety Prod. Co.
Seen Safety Fred. Co.
Seen Safety Fred. Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.
United States Safety Service Co.
Weish Mfg Co.
William Products Div.,
Ray-O-Vac Co.
Helimets, Firemen's

Helmets, Firemen's

American LaFrance,
Div, of Sterling Precision Corp.
Bullard, E. D., Co.
Fyrspel Froducts, Inc.
Fyr-Fyter Co.
Geniax Corp.
Goodall Rubber Co.
Industrial Givee Co.
Industrial Givee Co.
Industrial Froducta Co.
Mine Bafety Appliances Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Snyder, M. L., & Son, Inc.
Standard Giove Co.
Wheeler Protective Apparel, Inc.

#### Helmets, Sandblast

Helmets, Sandblast

American Optical Co.

American Optical Co.

Builard. E. D., Co.

Chicago Ere Shield Co.

Pribre-Metal Prod. Co.

General Scientific Equip. Co., Inc.

Fibre-Metal Prod. Co.

General Scientific Equip. Co.

General Scientific Equip. Co.

General Scientific Equip. Co.

General Scientific Equip. Co.

Kimbail Bafety Products Co.

Kimbail Bafety Appliances Co.

Mine Bafety Appliances Co.

New Jersey Bafety Equip. Co.

Olympic Glove Co., Inc.

Pangborn Corp.

Pulmosan Safety Equip. Co., Inc.

Bafety Clothing & Equip. Co.

Safety Frat Supply Co.

Seco Bafety Frod. Co.

Standard Fastey Equipment Co.

United States Rubber Co.

William Products Div.,

Ray-O-Vac Co.

Helmets. Welding

relmers, Welding
American Industrial Safety Equip. Co.
American Optical Co.
Boyer-Campbell Co.
Brossard, Lester L., Co.
Bullard, E. D., Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Dockson Corp.
Eastern Safety Equip. Co.

Fendall Ce.

Fire-Metal Prod. Co.

Fyrapal Products, Inc.

General Scientific Equip. Co.

General Scientific Equip. Co.

General Settentific Equip. Co.

Jackson Products

Kimball Safety Products Co.

Mine Safety Appliances Co.

National Mine Service Co.

Olympic Glove Co., Inc.

Pulmosan Safety Equip. Corp.

Bochester Safety Equip. Co., Inc.

Safety First Supply Co.

Safety First Supply Co.

Selentific Industrial Supply Co.

Second Safety Prod. Co.

Second Safety Equip.

Standard Glove Co.

Standard Glove Co.

Standard Safety Equipment Co.

Welsh Mfg. Co.

Wilson Protective Apparel, Inc.

Wilson Products Div.,

Ray-O-Vac Co.

Hoods, Acid

Hoods, Acid

American Optical Co.
Bullard, E. D., Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co.,
General Scientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Olympic Giova Co., Inc.
Pulmosan Safety Equip. Corp.
Eacord Industrial Co.
Daries Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety Pirts Supply Co.
Seco Safety Prod. Co.
Standard Glova Co.
Union Industrial Equip. Corp.
Wheeler Protective Apparel, Inc.

Hoods, Dust Hoods, Dust

American Optical Co.
Bullard, E. D., Co.
Chicago Eye Shield Co.
Duris Emergency Equip. Co., Inc.
Duris Emergency Equip. Co., Inc.
Doctagon Corp.,
Frendell Co.
Frendell Co.
Frendell Co.
Frendell Co.
Frendell Co.
General Scientific Equip. Co.
Industrial Froducts Co.
Kennedy-Ingalis, Inc.
Kimball Bafety Products Co.
Mine Bafety Appliances Co.
Mine Bafety Appliances Co.
New Jerney Safety Equip. Co.
Olympic Glove Ca., Inc.
Panagborn Corp.
Plantimayd Corp.
Plantimayd Corp.
Plantimayd Corp.
Rochester Safety Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Salistrom Affa. Co.
Seco Safety Prod. Co.
Salistrom Affa. Co.
Swillstom Affa. Co.
Swillstom Products Div.,
Ray-O-Vac Co.
Hoods. Enameters'

#### Hoods, Enamelers'

Hoods, Enamelers'
Chicago Ere Shield Co.
Devilbias Co.
Dockson Corp.
Fyrepel Products, Inc.
General Scientific Equip. Co.
Holcomb Safety Garment Co.
Industrial Products Co.
Kennedy-Ingalis, Inc.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co.,
Safety Clothing & Equip. Co.
Standard Giere Co.
Standard Giere Co.
Standard Safety Equipment Co.
Wheeler Productive Apparel, Inc.

HOOGS, INSULATOR

Kennedy-Ingalia, Inc.

Kimball Safety Products Co.

Mine Safety Appliances Co.

Olympic Glove Co., Inc.

Pulmosan Safety Equip. Corp.

Rochester Safety Equip. Co., Inc.

Safety Clothing & Equip. Co.

Salsbury, W. H., & Co.

Seco Safety Fred. Co.

Standard Glove Co.

Wheeler Protective Apparel, Inc.

Indicators, Oxygen Deficiency

American Allsafe Co., Inc.
Davis Emergency Equip. Co., Inc.
Mine Safety Appliances Ce.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co.

Standard Glove Co. Stephenson Corp. Union Industrial Equip. Corp.

Inhalators

Inhalators
Cycle-Flo Co.
Davis Emergency Equip. Co., Inc.
E. & J Mfg. Co.
Emerson, J. H., Co.
Eyr-Fytor Co.
General Scientific Equip. Co.
Industrial Products Co.
Karel First Aid Supply Co.
Mine Bafety Appliances
Coxygen Equip. & Service Co.
Rochester Safety Equip. Co., Inc.
Bafety First Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Staphenson Corp.

Lens, Industrial

Lens, Industrial

American Industrial Safety Equip. Ce.
American Optical Co.
Bauteh & Lomb Optical Co.
Chicago Eye Shield Co.
Eastern Safety Equip. Co.
Gaesaral Scientific Equip. Co.
Gaesaral Scientific Equip. Co.
Gaesaral Safety Products Co.
Mino Safety Appliances Co.
National Mino Safety Co.
Co.
Chicago Eye Shield Co.
Co.
Chicago Eye Shield Co.
Chicago Eye Shield Co.
Co.
Chicago Eye Co.
Chicago Eye

Lens, Inspection

Lens, Inspection
American Industrial Safety Equip. Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Fundall Co.
General Scientific Equip. Co.
Glendale Optical Co., Inc.
Industrial Products Co.
Rochester Safety Equip. Co., Juc.
Safety First Supply Co.
Standard Glove Co.
Watchesmoket Optical Co., Inc.

Lens, Prescription

American Industrial Safety Equip. Co. American Optical Co.
Bausch & Lomb Optical Co.
Bausch & Lomb Optical Co.
Chicage Exp Shield Co.
Davis Emergency Equip. Co., Inc.
General Scientific Equip. Co.
Glendale Optical Co., Inc.
Industrial Products Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
Kimball Safety Equip. Co., Inc.
Bochoster Safety Equip. Co., Inc.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Titunus Optical Co., Inc.
United States Safety Service Co.
Willion Products Div.,
Ray-O-Vac Co.

Magnifiers

Magnifiers

American Industrial Safety Equip. Co.
American Optical Co.
Estado Delical Co.
Bauch & Lomb Optical Co.
Buyer-Campbell Co.
Buyer-Campbell Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Giendale Optical Co., Inc.
Hornik, Frederick
Industrial Products Co.
Karel First Aid Supply Co.
Karel First Aid Supply Co.
Rochester Bafety Equip. Co., Inc.
Bafety Clothing & Equip. Co.
Safety First Supply Co.
Standard Glove Co.

Standard Glove Co.

Mask, Abrasive Blasting

Mask, Abrasive Blasting
American Optical Co.
Bullard. E. D., Co.
Chicago Ere Shield Co.
Davis Emergency Equip. Ce., Inc.
Eastern Safety Equip. Co., Inc.
Eastern Safety Equip. Co., Co.,
General Scientific Equip.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
National Mine Service Co.
Olympic Glove Ct., Inc.
Fulmosan Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Inc.
Safety Clothing & Equip. Co.

(section 5-continued)

Safety First Supply Co. Searjeant Metal Products Inc. Seco Safety Prod. Co. Standard Glove Co. Willson Products Div., Ray-O-Vac Co.

#### Masks, Acid Gas

Masks, Acid Gas

Acmo Protection Equip. Co.

Bullard, E. D., Co.

Davis Emergener Equip. Co., Inc.

Eastern Safety Equip. Co., Inc.

Eyr.-Fyter Co.

General Scientific Equip. Co.

Industrial Products Co.

New Jersey Safety Equip. Co.

New Jersey Safety Equip. Co.

Pulmosan Safety Equip. Co., Inc.

Safety Colthing & Equip. Co., Inc.

Safety First Supply Co.

Safety Colthing & Equip. Co.

Safety First Supply Co.

Safety First Supply Co.

Safety First Supply Co.

Safety Ending Co.

Safety Ending Co.

Safety First Supply Co.

Safety Colthing & Equip. Co.

Safety First Supply Co.

Safety First Supply Co.

Sandard Glove Co.

Standard Safety Equipment Co.

Willian Froducts Div.,

Kay-O-Vac Co.

#### Masks, All-Service

Masks, All-Service

Acms Protection Equip. Co.
Anserican LaFrance
Div. of Sterling Precision Corp.
Bullard. E. D., Co.
Davis Emergency Equip. Co., Inc.
Esatern Safety Equip. Co.
Fyr-Fyter Co.
General Scientific Equip. Co.
Industrial Products Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Corp.
Inchester Barley Equip. Corp.
Inchester Barley Equip. Corp.
Inchester Barley Equip. Co.
Scott Ariation Corp.
Seerjeant Metal Products Inc.
Seo Safety Prod. Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.
Willion Froducts Div.,
Ray-O-Vac Co.

#### Masks, Ammonia Gas

Masks, Ammonia Gas

Acme Protection Equip. Co.
American LaFrance,
Div. of Sterling Precision Corp.
Bullard. E. D., Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co., General Scientific Equip. Co.
General Scientific Equip. Co.
Hindustrial Products Co.
Kimbail Safety Products Co.
Mime Safety Appliances Co.
New Jorsey Bafety Equip. Co.
Fochester Safety Equip. Co.
Fochester Safety Equip. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Exact Aviation Corp.
Seco Safety Prod. Co.
Standard Glove Co.
Mine Safety Equip. Co.
Safety First Supply Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.

#### Masks, Babbitting

Chicago Eye Shield Co. Fendall Co. General Scientific Equip. Co. Fendall Co.
General Scientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.,
Pulmosan Safety Equip. Co.,
Pulmosan Safety Equip. Co. Inc.
Safety First Supply. Co..
Safety First Supply. Co..
Standard Glove Co.
Standard Glove Co.
Willson Products Div.,
Bay-O-Yac Co.

#### Masks, Carbon Monoxide

Masks, Carbon Monoxide

Acma Protection Equip. Co.

American LaFrance.

Div. of Sterling Precision Corp.

Bullard. E. D., Co.

Davis Emergency Equip. Co., Inc.

Eyr-Fyter Co.

General Scientific Equip. Co., Inc.

Industrial Products Co.,

Mine Safety Appliances Co.,

New Jersey Safety Equip. Co., Dr.

Rochaster Safety Equip. Co., Inc.

Safety First Supply Co.

Safety First Supply Co.

Safety First Supply Co.

Sandard Glove Co.

Standard Glove Co.

Standard Safety Equipment Co.

Willow Freducts Div.,

Ray-O-Vac Co.

#### Masks, Gas, Welding

Masks, Gas, Weldling

Aams Protection Equip. Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co.
Geoeral Seientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Mine Bafety Appliances Co.
Mine Bafety Appliances Co.
New Jersey Bafety Equip. Co.,
Pulmonan Safety Equip. Co.,
Pulmonan Safety Equip. Co.,
Inc.
Safety First Supply Co.
Saco Bafety Prod. Co.
Standard Glove Co.
William Products Div.,
Ray-O-Vac Co.

Masks, Hose (Fresh Air) Masks, Hose (Fresh Air)

Acme Protection Equip. Co.
American LaFrance,
Div. of Sterling Precision Corp.
Bullard, E. D., Co.
Davis Emergency Equip. Co., Inc.
Esastern Safety Equip. Co.
Fyr-Fyter Co.
Industrial Products Co.
Mine Safety Aphilances Co.
Mine Safety Aphilances Co.
New Jersey Safety Equip. Co.
Pulmosan Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Safety First Supply Co.
Safety First Supply Co.
Seco Safety Prod. Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.

#### Masks, Hose (Supplied Air)

Masks, Hose (Supplied Air)

Acme Protection Equip. Co.

American LaFrance,
Div. of Sterling Precision Corp.

American Optical Co.

Bullard, E. D., Co.

Lastern Safety Equip. Co., Inc.

Eastern Safety Equip. Co.

Now Jersey Safety Equip. Co.

Now Jersey Safety Equip. Co.

Rachety Epithing & Equip. Co.

Safety Ething & Equip. Co.

Safety First Supply Co.

Safety Entit Supply Co.

Safety Ford. Co.

Standard Glove Co.

Standard Glove Co.

Standard Glove Co.

Standard Safety Equipment Co.

Masks, Organic Vapor

Acme Protection Equip. Co.
American LaFrance,
Dally, of Sterling Precision Corp.
Autrican Optical Co.
Bullier, D. Optical Co.
Bullier, D. Optical Co.
Davis Emergence Equip. Co., Inc.
Essent Selfett Equip. Co., Inc.
Essent Selfett Equip. Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.,
Pulmosan Safety Equip. Co.,
Pulmosan Safety Equip. Co.,
Safety Clothing & Equip. Co.,
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Safety Ford Co.,
Safety Equip. Co.,
Safety Ford Co.,
Safety Equip. Co.,
Safety Equip. Co.,
Safety Equip. Co.,
Safety First Supply Co.

### Oxygen Breathing Apparatus

Oxygen Breathing Apparatus
American LaFrance,
Div. of Sterling Precision Corp.
Bullard, E. D., Co.
Cycle-Fie Co.
Davis Emergency Equip. Co., Inc.
E & J Mg. Co.
Emergox, Inc.
Flisher Scientific Co.
Fyr-Fyter Co.
Globe Industries, Inc.,
Medical & Hospital Dept.
Karel First Aid Supply Co.
Mines Bafety Appliances Co.
Monaghan, J. J., Co., Inc.
New Jerosy Bafety Equip. Co.,
Oxygen Equip. & Service Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Standard Glove Co.

#### Oxygen Recorders

Davis Emergency Equip. Co., Inc. Mine Safety Appliances Co. Rochester Safety Equip. Co., Inc. Stephenson Corp.

Rescue Apparatus, Diving and Underwater Davis Emergency Equip. Co., Inc. Muter Company Rechaster Safety Equip. Co., Inc. Safety First Supply Co.

To locate Advertisements, see Advertisers' Index.

Scott Aviation Corp. Beco Safety Prod. Co.

#### Respirators, Air-Line

Respirators, Air-Line
American Optical Co.
Builard, E. D., Co.
Chicage Eye Shield Co.
Davia Emergency Equip. Co., Inc.
Eastern Safety Equip. Co., Inc.
Eastern Safety Equip. Co.
General Scientific Equip. Co.
Industrial Products Co.
Alimball Safety Products Co.
Alimball Safety Products Co.
Monaghan, y. philames. Inc.
New Jersey Hafety Equip. Co.
Pulmosan Safety Equip. Co.
Pulmosan Safety Equip. Co.
Rafety Clothing & Equip. Co.
Safety First Supply Co.
Safety Frod Co.
Standard Glove Co.
Standard Safety Equipment Co.
William Products Div.,
Ray-O-Vac Co.

#### Respirators, Dust-Type A

Respirators, Dust.—Type A
American Industrial Safety Equip. Co.
American Optical Co.
Brossard, Lester L., Co.
Chicaso Ere Shield Co.
Cover, H. S., Co.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co.,
Fendall Co.
General Ecientific Equip. Co.
Industrial Products Co.
Mino Safety Appliances Co.
Mino Safety Appliances Co.
Mino Safety Equip. Co.
Olympic Glove Co., Inc.
Panghorn Curp.
Panghorn Curp.
Panghorn Curp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety Equip. Co.
Safety Equip. Co.
Safety Equip. Co.
Safety First Supply Co.
Safety Safety First Supply Co.
Safety Cothing & Equip. Co.
Safety Cothing & Equip.
Safety First Safety Equipment Co.
Safety Safety Equipment Co.
Watchemoket Optical Co., Inc.
Willson Products Div.,
Ray-O-Vac Co.

## Respirators, Dust—Type A and Lead-Combination

.ead-Combination
American Optical Co.
Buillard, E. D., Co.
Chicago Eye Shield Co.
Chicago Eye Shield Co.
Corez, H. S., Co.
Davilloss Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Mino Bafety Appliances Co.
New Jersey Bafety Equip. Co.
Olympic Glove Co., Inc.
Pangborn Corp.
Pulmosan Satiry Equip. Corp.
Pulmosan Satiry Equip. Co.
Safety First Supply Co.
Standard Safety Equipment Co.
Weish Mrg. Co.
Weish Mrg. Co.
Wilson Products Div.,
Ray-O-Yae Co.

#### Respirators, Dust-Lead

Respirators, Dust-Lead
American Industrial Safety Equip. Ce.
American Optical Co.
Brossard, Lester L., Co.
Brossard, Lester L., Co.
Brossard, Lester L., Co.
Brossard, Ester L., Co.
Builard, E. D., Co.
Chicago Ere Shield Co.
Davis Emergency Equip. Co., Inc.
DeVilbias Co.
Eastern Safety Equip. Co.
Fendall Co.
General Selevit Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
New Jerser Safety Equip. Co.
Olympic Glove Co., Inc.
Pulmocan Safety Equip. Co.
Dirapite Glove Co., Inc.
Bafety Chothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.
Weisb Mfg. Co.
Bands Mfg. Co.
Bardon Mfg. Co.
Brandord Div.,
Ray-O-Vac Co.

#### Respirators, Fume

American Optical Co. Bullard, E. D., Co.

(section 5-continued)

Chicago Eye Shieid Co.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Essient Safety Equip. Co.
Essient Safety Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co., Inc.
Safety Lothing & Equip. Co., Inc.
Safety Clothing & Equip. Co., Safety Clothing & Equip. Co., Safety Emis Deppir Co.,
Safety First Deppir Co.,
Safety First Deppir Co.,
Selistrom Mfg. Co.,
Standard Safety Equipment Co.
Willian Products Div.,
Ray-O-Yac Co.

Respirators, Gas Respirators, Gas

American Optical Co.

Bullard, E. D., Co.

Davis Emergency Equip. Co., Inc.

Eastern Safety Equip. Co., General Scientific Equip. Cs.

Industrial Products Co.

Kimball Safety Products Co.

Min Safety Appliance Co.

Pulmosan Safety Equip. Co., Pulmosan Safety Equip. Co., Pulmosan Safety Equip. Co., Safety Cothing & Equip. Co., Safety Prins Supply Co., Geo Safety Prod. Co.

Standard Clove Co.

Standard Safety Equip. Co.

Respirators, Mists Respirators, Mists

American Optical Co.

Bullard, E. D., Co.

Chicage Representation Co.

Chicage Representation Co.

Chicage Representation Co.

Chicage Representation Co.

Eastern Aafety Equip. Co.

General Relentific Equip. Co.

Industrial Products Co.

Kimbail Barfety Products Co.

Kimbail Barfety Products Co.

Kimbail Barfety Appliances Co.

New Jersey Safety Equip. Co.

Pulmosan Barfety Equip. Co.

Fulmosan Barfety Equip. Co.

Fulmosan Barfety Equip. Co.

Rafety First Supply Co.

Safety First Supply Co.

Sellstrom Mfg. Co. Seco Safety Prod. Co. Standard Glove Co. Standard Safety Equipment Co. Welsh Mfg. Co. Willson Products Div., Ray-0-Vac Co.

Resuscitation Equipment Resuscitation Equipment
Bullard, E. D., Co.
Cyclo-Fio E., Co.
Davis Emergence Equip. Co., Inc.
Davis Emergence Equip. Co., Inc.
Emergence, J. H., Co.
Fyr.-Fyter Co.
General Scientific Equip. Co.
Globe Industries, Inc.,
Medical & Hospital Dept.
Industrial Products Co.
Karel First Ald Supply Co.,
Karel First Ald Supply Co.,
Monaghan, J. F. Co., Inc.
Oxygen Equip. & Service Co.,
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Stephenson Corp.

Spectacles, Industrial

American Industrial Safety Equip, Co.
American Optical Co.
Baulen's Lomb Optical Co.
Bullard's E. Distance Co.
Dockson Corp.
Esatern Safety Equip, Co.
Fendall Co.
General Scientific Equip. Co.
General Scientific Equip. Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
National Mine Service Co.
National Mine Service Co.
National Mine Service Co.
Placons Safety Prod. Co.
Pulmosan Safety Equip. Corp.
Bub. of Bausch & Lomb Optical Co.
Placons Safety Prod. Co.
Pulmosan Safety Equip. Co.
Nafety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Glove Co.
Willson Products Dit.,
Ray-O-Vac Co. Spectacles, Industrial

Sun Glasses American Optical Co.

Bausch & Lomb Optical Co.

Bausch & Lomb Optical Co.

Giendale Optical Co.

Industrial Products Co.

Pioneer Scientific Corp.,

Sub. of Bausch & Lomb Optical Co.

Bochester Safety Equip. Co., Inc.

Safety First Supply Co.

Titmu Optical Co., Inc.

Watchemoket Optical Co., Inc.

Willson Products Div.,

Ray-O-Vac Co.

Sweat Bands

Allied Glore Corp.
American Alliade Co., Inc.
American Alliade Co., Inc.
American Optical Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Bullard, E. D., Co.
Chicago Eye Shield Co.
Davis Emergency Equip. Co., Inc.
Emergency Equip. Co.
Flower Safety Equip. Co.
Flower Safety Equip. Co.
Flower Safety Equip. Co.
General Bandages, Inc.
General Bandages, Inc.
General Scientific Equip. Co.
Genter Corp.
Giendale Optical Co., Inc.
Industrial Products Co.
Industrial Products Co.
Industrial Glores Co.
Industrial Products Co.
Num Jersey Safety Equip.
Co.
Mine Safety Appliances Co.
New Jersey Safety Equip.
Co.
Diwnic Glore Co., Inc.
Plasco Safety Frod. Co.
Plasco Safety Frod. Co.
Safety First Supply Co. Sweat Bands

Vision Testing Equipment American Optical Co.
Bausch & Lomb Optical Co.
Industrial Products Co.
Karel First Aid Supply Co.
Porto-Clinic Instruments, Inc.
Rochester Safety Equip. Co., Inc.
Titmus Optical Co., Inc.

## Section 6 Personal Protection—Part 2

Aprons

Advance Glore Mig. Co.

Alar Mig. Co. Inc.

Alar Mig. Co. Inc.

Allard Glore Corp.

American Allasfe Co., Inc.

American Mig. & Sales Co.

American Mig. & Sales Co.

American Mig. & Sales Co.

Brossard, Lesiar L., Co.

Brossard, Lesiar L., Co.

Brossard, Lesiar L., Co.

Brossard, Lesiar L., Co.

Charleson Rubber Co.

Charleson Rubber Co.

Charleson Rubber Co.

Charleson Rubber Co.

Frommel Lodustries

Fyrepel Products, Inc.

General Scientific Co.

Frommel Industries

Fyrepel Products, Inc.

General Scientific Equip. Co.

Goodall Rubber Co.

Holcomb Safety Garment Co.

Holcomb Safety Garment Co.

Holcomb Safety Garment Co.

Holcomb Safety Garment Co.

Kennedy-Ingalls, Inc.

Kennedy-Ingalls, Inc.

Kennedy-Ingalls, Inc.

Kimball Safety Products Co.

Midwest Glore Co., Inc.

Mine Safety Appliances Co.

New Jersey Safety Equip. Co.

Olympic Glore Co., Inc.

New Jersey Safety Equip.

Co.

Plastimayd Corp.

Plastimayd Corp.

Rainfair, Inc.

Record Industrial Supply Co.

Safety First Supply Co.

Safety Fi Aprons

Aprons, Metal Mesh Allied Gleve Corp. Boyer-Campbell Co. Industrial Products Co.

Midwest Glove Co., Inc.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety First Supply Co.

Automobile Safety Belts Bullard, E. D., Co.
Industrial Products Co.
Miller Equip. Co.. Inc.
Rose Mfg. Co.
Safety Equip. Co., Inc.
Rose Mfg. Co.
Safety Cothing & Equip. Co.
Safety First Supply Co.

Bags, Linemen's Glove Bags, Linemen's Glove

Bashlin, W M., Co.
Bullard, E. H., Co.
Bullard, E. D., Co.
Charleston Bubber Co.
Davis Emergency Equip. Co., Inc.
Miller Equip. Co., Inc.
Clymple Glove Co., Inc.
Miller Equip. Co., Inc.
Safety First Supply Co.
Salisbury, W. H., & Co.
Salisbury, W. H., & Co.
Salisbury, W. H., & Co.
Salisbury, W. M. L., & Son, Inc.
Standard Glove Co.
Surety Rubber Co.

Bags, Linemen's Sleeve Sags, Linemen's Sieeve

Bashlio, W. M., Co.

Buhrde, R. H., Co.

Bullard, E. D., Co.

Charleston Rubber Co.

Dorsey, John E., Co.

Jonae Inc.

Midwest Glove Co., Inc.

Midwest Glove Co., Inc.

Midler Equip. Co., Inc.

Miller Equip. Co., Inc.

Safety First Supply Co. Salisbury, W. H., & Co. Scientific Industrial Supply Co. Standard Glove Co. Surety Rubber Co.

Belt Shock Absorbers Bullard, E. D., Co.
Eastern Safety Equip. Co.
Industrial Products Co.
Miller Equip. Co., Inc.
Mine Safety Appliances Co.
Rochester Safety Equip. Co., Inc.
Rose Mfg. Co.
Safety First Supply Co.

Belts, Linemen's Belts, Linemen's

Bashlin, W. M., Co.

Bubriko, R. H., Co.

Bubriko, R. H., Co.

Eastern Safety Equip. Co.

General Scientific Equip. Co.

Industrial Products Co.

Industrial Safety Belt Co.,

Kielin, Mathias, & Sons, Inc.

Miller Equip. Co., Inc.

Milne Bafety Appliances Co.,

New Jersey Safets Equip. Co.,

Pulmosan Safety Equip. Co.,

Fulmosan Safety Equip. Co.,

Safety First Supply Co.,

Scientific Industrial Supply Co.,

Scen Safety Prod. Co.,

Standard Glove Co.

Belts, Safety

Bashlin, W. M., Co.

Bulard, E. D., Co.

Bulard, E. D., Co.

Buhrke, R. H., Co.

Davis Emergency Equip. Co., Inc.

Eastern Safety Equip. Co.

General Scientific Equip. Co.

General Scientific Equip. Co.

Industrial Products Co.

Industrial Products Co.

Industrial Safety Belt Co.

Industrial Safety Belt Co.

Kielen, Mahalas, R. Sons, Inc.

Miller Equip. Co., Inc.

Safety Fatt, Co.

Safety First Supply Co.

Safety First Supply Co.

Scientific Industrial Supply Co.

Scientific Industrial Supply Co.

Standard Glore Co. Belts, Safety

(section 6-continued)

Blankets, Fireproofed

Blankets, Fireproofed

Advance Glove Mfg. Co.
Adlay Mfg. Co., Inc.
Adlay Mfg. Co., Inc.
Bullard, E. D., Co.
Cotton Goods Mfg. Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co., Inc.
Eastern Safety Equip. Co.
Frommelt Industries
Fyrepel Products, Inc.
General Scientific Co.
Flowmelt Industries
Fyrepel Products, Inc.
General Scientific Equip. Co.
Industrial Glores Co.
Industrial Glore Co.
Industrial Glores Co.
Industrial Glor

#### Blankets, Linemen's Plastic

Slankets, Linemen's Plastic
Goodall Rubber Co.
Industrial Products Co.
Industrial Products Co.
Industrial Products Co.
Industrial Products Co.
Industrial Service Co.
Plastimayd Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Salisbury, W. H., & Co.
Selentific Industrial Supply Co.
Snyder, M. L., & Son, Inc.

Blankets, Linemen's Rubber
Davis Emergency Equip. Co., Inc.
Goodall Rubber Co.
Industrial Products Co.
Olympic Glove Co., Inc.
Safety First Supply Co., Inc.
Safety First Supply Co., Sulfabury, W. H., & Co.
Sulfabury, W. H., & Co.
Sulfabury, W. H., & Co.
Sunder, M. L., & Bon, Inc.
Standard Glove Co.
Surety Rubber Co.

#### Blankets, Wool Safety

Blankets, Wool Safety

Boyer-Campbell Co.
Cotton Good Mirg. Co.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co.
General Scientific Equip. Co.
Holoumb Safety Gament Co.
Industrial Products Co.
Industrial Products Co.
Industrial Frontest Co.
Industrial Frontest Co.
Industrial Frontest Co.
Industrial Frontest Co.
Inc.
Karel First Aid Supply Co.
Kimball Safety Appliances Co., Inc.
Karel First Aid Supply Co.
Kimball Safety Appliances Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Faulpment Co.
Standard Safety Faulpment Co.
Standard Safety Regulpment Co.
Wheeler Protective Apparel, Inc.

#### Boot Liners

Hoost Libers
Industrial Products Co.
Iron Age Safety Shoe Div.
H. Childs & Co., Inc.
Jonac Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Miller Safety Appliances Co.
Olympic Glove Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Snyder, M. L., & Son, Inc.

#### Boots, Linemen's

Boots, Linemen's

Advance Glove Mg. Co.
Bashlin, W. M., Co.
Bone-Dry Shoe Mg. Co.
Bone-Bry Shoe Mg. Co.
Bone-Bry Shoe Mg. Co.
Bone-Bry Shoe Mg. Co.
Bone-Bry Shoe Div.
Bearleant Metal Product
Sec Safety Prod. Co.
Singer Glove Co.
Industrial Products Co.
Olympic Glove Co.
Inc.
Record Industrial Co.
Record Industrial Co.
Record Industrial Co.
Record Industrial Co.
Bone-Bry Shoe Mg. Co.
Bone-Bry Shoe Mg. Co.
Bone-Bry Mg. Co.
Bone-Bry Shoe M

#### Boots, Neoprene

Allied Glove Corp.
Davis Emergency Equip. Co., Inc.

Eastern Safety Equip. Co.

Pyr-Pyter Co.
Goodall Rubber Co.
Iron Age Safety Shoe Div.,

H. Childs & Co. Inc.
Age Safety Shoe Div.,

H. Childs & Co. Inc.
Co.
Iron Age Safety Shoe Div.,

H. Childs & Co. Inc.
Co.
Iron Age Safety Shoe Div.,

H. Childs & Co. Inc.
Co.
Record Industrial Supply Co.
Sonders Pirst Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Stryder, M. L., & Son, Inc.
Standard Gleve Co.
Tingler Rubber Corp.
Wash Rite Co., Inc.

#### Boots, Rubber

Boots, Rubber

Advance Glove Mig. Co.
Allied Glove Corp.
American LaFrance,
Div. of Sterling Precision Corp.
Beacon Falls Rubber Footwear
Dorsey, John E. Co.
Bastern Safety Rouip. Co.
Bastern Safety Rouip.
Co.
Bootall Rubber Co.
Industrial Products Co.
Irea Age Safety Shoe Div.,
H. Childs & Co., Inc.
Midwest Glove Co., Inc.
Olympic Glove Co., Inc.
Place Safety Foot.
Co., Inc.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Stendand Metal Products Inc.
Snyder, M. L., & Son, Inc.
Standard Glove Co.
Tingley Rubber Corp.
Tagles States Rubber Co.
Unales States Rubber Co.
Wash Rite Co., Inc.

#### Boots, Safety Toe

Boots, Safety Toe

Advance Glore Mig. Co.
Advance Glore Mig. Co.
Allied Glore Corp.
Bone-Dry Shoe Mig. Co.
Bronson Shoe Co.
Eastern Safety Equip. Co.
Goodall Rubber Co.
Eastern Safety Equip. Co.
Goodall Rubber Co.
Inches Co.
Inches

#### Boots, Wooden Sole

BODES, WOOGER Sole

Bascon Falls Rubber Footwear
Fyrepel Products. Inc.
General Scientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
New Jersey Safety Equip. Co.
Record Industrial Co.
Recee Wooden Sole Shoo Co.
Rockees Bafety Equip. Co., Inc.
Safety First Supply Co., Co.
Safety First Supply Co., Scientific Industrial Scientific Industrial Scientific Industrial Supply Co.
Standard Glove Co.

## Canvas, Fireproofed

Canvas, Fireproofed

Advance Glore Mfg. Co.
Allay Mfg. Co. Inc.
American Optical Co.
Frommelt Industries
Holcomb Safety Garment Co.
Frommelt Industries
Holcomb Safety Garment Co.
Industrial Products Co.
Kannedy-Ingalls, Inc.
Klimball Safety Products Co.
Midwest Glore Co., Inc.
Miller Equip. Co., Inc.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Searjeant Metal Products Inc.
Seco Safety Prod. Co.
Singer Glore Mfg. Co.
Standard Glove Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

Climbers, Linemen's

Bashlin, W. M., Co.

Bashlin, W. M., Co.

General Scientific Equip. Co.

Industrial Products Co.

Kitela, Mathias, & Sens, Inc.

Kitela, Mathias, & Sens, Inc.

Miller Equip. Co., Inc.

Miller Equip. Co., Inc.

Miller Equip. Co., Inc.

Advance Glove Mig. Co.

Advance Glove Mig. Co.

Safety Pirit Supply Co., Inc.

Safety Pirit Supply Co., Sens, Inc.

American Allase Co., American Optical Co.

#### Cloth, Asbestos

Cloth, Asbestos

Allied Glore Corp.
Cotton Goods Mfg. Co.
Eastern Safety Equip. Co.
Frommel Industries
Industries
Industries
Industries Industries
Industries Ireduces
Industries Ireduces
Industries Ireduces
Industries Ireduces
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#### Cloth, Coated, Safety

Cloth, Coated, Safety

Advance Glove Mfg. Co. A.
Alay Mfg. Co. Inc.
Frammost Industries
Industrial Gloves Co.
Industrial Gloves Co.
Jomes Imperiment Co.
Jomes Imperiment Co.
Jomes Imperiment Co.
Jomes Imperiment Co.
Midwest Glove Co., Inc.
Clympic Glove Co., Inc.
Clympic Glove Co., Inc.
Pulmosan Safety Equip. Corp.
Rapbestos-Manhattan, Inc.
Rapbestos-Manhattan, Inc.
Safety Enthing Safety Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.
Whoeler Protective Apparel, Inc.

#### Clothing, Acid Resistant

Clothing, Acid Resistant
Advance Glove Mfg. Co.
American Alisafe Co., Inc.
American Alisafe Co., Inc.
American Alisafe Co., Inc.
Bullard E. D., Co.
Chrysler Textilies Ind.,
Industrater Div.
Dorsey, John E., Co.
Evrenel Products, Inc.
General Scientific Equip. Co.
Industrial Gloves Co.
Industrial Gloves Co.
Industrial Froducts Co.
Industrial Products Co.
Institute of Industrial Launderers
Jomae Inc.
Kennedy-Ingalls, Inc.
Midwest Glove Co., Inc.
Plasco Bafety Appliances Co.
Dirmonan Safety Equip. Co.
Pulmosan Safety Equip. Co.
Pulmosan Safety Equip. Co., Inc.
Record Industrial Co.
Inc.
Record Industrial Co.
Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Scientific Industrial Squip. Co., Sectow, M., & Son, Inc.
Stryder, M. L. & Son, Inc.
Stryder, M. L. & Son, Inc.
Stryder, M. L. & Son, Inc.
Wheeler Protective Apparel, Inc.
Wheeler Protective Apparel, Inc.
Clothing, Fireproofed

#### Clothing, Fireproofed

Clothing, Fireproofed

Advance Glove Mig. Co.

Aliay Mig. Co. Mig. Co.

Aliay Mig. Co. Mig. Co.

Aliay Mig. Co. Mig. Co.

Aliay Mig. Co.

Loc.

Aliay Mig. Co.

Loc.

Lo

Advance Glove Mfg. Co.
Aljay Mfg. Co. Inc.
American Allsafe Co., Inc.
American Optical Co.

(section 6—continued)

Basco Falis Rubber Fostswar Beyer-Campbell Co.
Bullard, E. D., Co.
Dorrey, John E., Ca.
General Scientific Equip. Co.
Goodall Rubber Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Forducts Co.
Institute of Industrial Launderers
Kennedy-Ingalls, Inc.
Kimball Safety Products Co.
Lyrusu Finishing Co., Inc.
Midwest Glore Co., Inc.
Mine Safety Appliances Co.
Olympic Glore Co., Inc.
Mine Safety Appliances Co.
Olympic Glore Co., Inc.
Rainfair, Inc.
Bacord Industrial Co.
Rochester Safety Equip. Corp.
Rainfair, Inc.
Racord Holustrial Co.
Rafety Choling & Equip. Co.
Safety First Supply Co.
Saco Safety Frod. Co.
Saco Safety Prod. Co.
Saco Safety Prod. Co.
Saco Safety Prod. Co.
Salow Mr. & Son, Inc.
Singar Glore Mfg. Co.
Standard Glore Co.
Standard Glore Co.
Standard Safety Equipment Co.
Wheeler Protective Apparel, Inc.
Kicop Metal Graing Corp.
Reliance Stele Prod. Co.

### Clothing, Leather

Clothing, Leather
Alliad Glove Corp.
American Alliade Co., Inc.,
American Optical Co.
Boyer-Campbell Co.
Brousard, Lester L., Co.
General Scientific Equip. Co.
Holcomb Safety Garment Co.
Holcomb Safety Garment Co.
Holcomb Safety Garment Co.
Holcomb Safety Froducts Co.
Kennedy-Ingalis, Inc.
Kimball Safety Products Co.
Midwest Glove Co., Inc.
Mine Safety Appliance Co.
Olympie Glove Co., Inc.
Plasor Safety Prod. Co.
Corp.
Record Industrial Co.
Rochester Safety Fed. Co.
Corp.
Record Industrial Co.
Safety First Supply Co.
Safety First Supply Co.
Sawyer-Tower, Inc.
Seco Safety Prod. Co.
Standard Safety Equip. Co.
Standard Safety Equip. Co.
Standard Safety Equip. Co.
Wheeler Protective Apparel, Inc.
Clothing, Linemen's

#### Clothing, Linemen's

Clothing, Linemen's

Aliay Mfg. Co. Ine.

American Optical Co.

Babilin, W. M., Co.

Dorssy, John E., Ce.,

General Scientific Equip. Co.

General Scientific Equip. Co.

Goodall Rubber Co.

Industrial Products Co.

Jonac Inc.

Midwest Giove Co., Inc.

Safety Clothing & Equip. Co., Inc.

Safety Clothing & Equip. Co.

Safety First Supply Co.

Safety First Supply Co.

Safety First Supply Co.

Safety Clothing & Equip.

Co.

Bawyer-Tower, Inc.

Standard Giove Co.,

Wheeler Protective Apparel, Inc.

### Clothing, Plastic

Clothing, Plastic

Beacon Falls Rubber Footweer

Freil Mig.
General Scientific Equip. Co.
General Scientific Equip. Co.
General Scientific Equip.
General Scientific Co.
Industrial Giove Co.
Karel First Aid Supply Co.
Karnedy-Ingalia, Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Co.
Microbert Scientific Co.
Olympic Giove Co., Inc.
Itanoo Safety Frod. Co.
Olympic Giove Co., Inc.
Itanoo Safety Frod. Co.
Pulmosan Safety Equip. Corp.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

#### Clothing, Protective

Advance Giore Mfg. Co.
Aliay Mfg. Co., Inc.
American Optical Co.
Baacon Fails Rubber Footwear
Boyer-Campbell Co.
Frommelt Industries

General Scientific Equip. Co.
Fiolcomb Safety Garment Co.
Industrial Gloves Co.
Industrial Products Co.
Industrial Safety Products Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Olympic Clove Co. Inc.
Plastimayd Corp.
Pulmosan Safety Equip. Corp.
Flastimayd Corp.
Ecohester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Setiow. M., & Son. Inc.
Standard Glere Co.
Standard Safety Equipment Co.
Union Industrial Equip. Corp.
Union Industrial Equip. Co

#### Clothing, Rubber

Clothing, Rubber

American LaFrance,
Div. of Sterling Precision Corp.
Beacon Falls Rubber Footwear
Dorsey, John E., Co.
Fyr-Fyter Co.
General Steintific Equip. Co.
General Steintific Equip. Co.
Goodall Rubber Co.
Mine Safety Appliances Co.
Olympic Glore Co., Inc.
Midwest Glore Co., Inc.
Midwest Glore Co., Inc.
Mine Safety Appliances Co.
Olympic Glore Co., Inc.
Plasco Bafety Frod. Co.
Fulmonan Safety Equip. Corp.
Rainfale, Bafety Frod.
Rainfale, Good Co., Inc.
Safety Clothing & Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Secon Safety Prod. Co.
Standard Glore Co.
Union Bacutrial Equip. Corp.
Wash Rite Co., Inc.
Clothing & Machemyroof

#### Clothing, Weatherproof

Clothing, Weatherproof
American Optical Co.
Beacon Falls Rubber Footwear
Dorsey, John E., Co.
General Scientific Equip. Co.
Goodall Rubber Co.
Industrial Products Co.
Jomae Ine.
Kennedy-Ingalis, Inc.
Kennedy-Ingalis, Inc.
Kennedy-Ingalis, Inc.
Midweel Glov Co. Inc.
Midweel Glov Co., Inc.
Midweel Glov Co., Inc.
Olympic Glove Co., Inc.
Plastinaryd Corp.
Rainfalr, Inc.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Indust

Clothing, Women Workers'
Advance Glove Mfg. Co. Clothing, Women Workers'
Advance Glove Mfg. Co.,
Allay Mfg. Co., Inc.
General Scientific Equip. Co.
Industrial Products Co.
Midwest Glove Co., Inc.
Mine Safety Applianess Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co.,
Fulmosan Safety Equip. Co.,
Safety Clothing & Equip. Co.,
Safety First Supply Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.
Wireklin Inc.

### Cots, Finger

Cots, Finger

Advance Gloro Mfg. Co.
Aliay Mfg. Co., Inc.
American Optical Co.
Bousard, Leater L., Co.
Brousard, Leater L., Co.
David's Glores, Inc.
David Engrescop Equip. Co., Inc.
David Edergescop Equip. Co., Inc.
David Edergescop Equip. Co., Inc.
David Edergescop Equip. Co.
Johns-Manville Sales Corp.
Karel First Ald Supply Co.
Kennedy-Ingalla, Inc.
Kimbail Safety Products Co.
Medical Supply Co.
Supply Co.
Medical Supply Co.

Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Giove Co.
Sundar, M. L., & Son, Inc.
Wash Bitz Co., Inc.
Wheeler Protective Apparel, Inc.

#### Curtains, Fireproofed

Curtains, Fireproofed
Advance Glove Mfg. Co.
Advance Glove Mfg. Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Brommelt Industries
Go.
Brommelt Industries
Go.
Brommelt Industries
Go.
Holecanb Sacty Garmant Co.
Industrial Glove Co.
Industrial Froducts Co.
Johns-Manville Sales Corp.
Kannedy-Ingalls, Inc.
Kimball Safety Froducts Co.
Midwest Glove Co., Inc.
New Jarsey Safety Equip. Co.
Midwest Glove Co., Inc.
New Jarsey Safety Equip. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co.
Safety First Supply Co.
Safety Glove Co.
Singer Glove Co.
Wheeler Protective Apparel, Inc.

#### Curtains, Welders'

Curtains, Welders?

Advance Glore Mfg. Co.
American Optical Co.
Boyer-Campbell Co.
Cotton Goods Mfg. Co.
Frommelt Industries
General Scientific Equip. Co.
Holicomb Safety Garment Co.
Industrial Glores Co.
Industrial Froducts Co.
Industrial Products Co.
Kindy Safety Products Co.
Midwest Glore Co., Inc.
New Jarsey Safety Equip. Co.
Olympic Glore Co., Inc.
Pulmosan Safety Equip. Co.
Olympic Glore Co., Inc.
Safety Chothing & Equip. Co.
Safety First Supply Co.
Safety Ford Co.
Standard Grove Mfg. Co.
Standard Grove Mfg. Co.
Standard Grove Mfg. Co.
Standard Grove Mfg. Co.
Standard Grove Standard Co.
Co.
College Control of Co.
College College Co.
College College Co.
College College Co.
College College College Co.
College College

# Film Badge Service

Adept Industries, Inc. Rochester Safety Equip. Co., Inc.

Flame Retardant Fabric
Holcomb Safety Garment Co.
Industrial Gloves Co.
Industrial Products Co.
Kimbell Safety Froducts Co.
Kimbell Safety Froducts Co.
Kimbell Safety Froducts Co.
Diympic Glove Co., Inc.
Pulmosan Safety Kauip. Corp.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

#### Gloves and Mittens

Gloves and Mittens

Advance Glove Mfg. Co., Inc.
Adlar Mfg. Co., Inc.
Allar Mfg. Co.
Charleston Rubber Co.
David's Gloves, Inc.
Estern Safety Equip. Co.
Edelmont Mfg. Co.
Fisher Scientific Co.
Fisher Scientific Co.
Granet Corp.
Holcomb Safety Garment Co.
Industrial Gloves Co.
Industrial Froducts Co.
Jomac Inc.
Kennedy-Ingalis, Inc.
Ken

(section 6-continued)

Surety Rubber Co.
Wash Rite Co., Inc.
Wheeler Protective Apparel, Inc.
Wilson Rubber Co.
Div. of Recton, Dickinson & Co.
Wolverine Shoe & Tanning Corp.

Gloves, Heat Resistant

Gloves, Heat Resistant

Advance Glove Mfg. Co.
Allied Glove Corp.
Allied Glove Corp.

Advance Glove Mfg. Co.
Allied Glove Corp.

Andrean Optical Co.
Beatern Safety Equip. Co.
Eastern Safety Equip. Co.
Eastern Safety Equip. Co.
Edmont Mfg. Co.
Fisher Scientific Co.
Fyrepel Froducts, Inc.
General Scientific Co.
Fyrepel Froducts, Inc.
General Scientific Co.
Johns-Manville Sales Corp.
Jonne Lo.
Kimball Safety Products Co.
Johns-Manville Sales Corp.
Jonne Inc.
Kimball Safety Products Co.
Liberty Frotoctive Leathers, Inc.
Liberty Frotoctive Leathers, Inc.
Liberty Frotoctive Leathers, Inc.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Mine Safety Equip. Corp.
Record Industrial Co.
Riegel Textile Corp.
Record Industrial Co.
Safety First Supply Co.
Safety First

Gloves, Linemen's Protective

Gloves, Linemen's Protective

Advance Glove Mfg. Co.

Allied Glove Corp.

American Optical Co.

Bashlin, W. M., Co.

Charleston Rubber Co.

Davis Emergeory Europ. Co., Inc.

Davis Emergeory Europ. Co., Inc.

Davis Emergeory Europ. Co., Co., Inc.

Davis Emergeory Europ. Co., Co., Inc.

Davis Emergeory Europ. Co., Inc.

Davis Emergeory Europ. Co., Inc.

Miller Equip. Co., Inc.

Selentific Industrial Co.

Rochester Safety Equip. Co., Inc.

Safety Clothing & Equip. Co.

Safety First Supply Co.

Salisbury, W. H., & Co.

Selentific Industrial Supply Co. Snyder, M. L., & Son, Inc.
Standard Glove Co.
Surety Rubber Co.
Wash Rits Co., Inc.
Wheeler Protective Apparel, Inc.
Wilson Rubber Co.
Dickinson & Co.
Dirt of Beeton, Dickinson & Co.
Division Shoe & Tanning Corp.

#### Gloves, Metal Mesh

Gloves, Metal Mesh
Allied Glove Corp.
Charleston Rubber Co.
David's Gloves, Inc.
General Scientific Equip. Co.
General Scientific Equip.
Co.
Midwest Glove Co., Inc.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Scientific Industrial Supply Co.
Standard Glove Co.

#### Gloves, Reclaiming

Charleston Rubber Co.
Institute of Industrial Launderers
Mine Safety Appliances Co.
Rochester Safety Equip. Co., Inc.
Scientific Industrial Supply Co.
Wash Rite Co., Inc.

#### Gloves, Rubber or Synthetic

Sloves, Rubber or Synthetic
Advance Glove Mfg. Co.
Allted Glove Corp.
American Optical Co.
David's Gloves, Inc.
Davis Emergency Equip. Co., Inc.
Eastern Safety Equip. Co., Inc.
Eastern Selentific Co.
Granet Selentific Co.
Granet Corp. Co.
Granet Corp.
Granet Corp. Co.
Junior Lord Co.
Junior Inc.
Junior In James Tee,
Kennedy-Ingalls, Inc.
Midwest Glove Co., Inc.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.

Pioneer Bubber Co.
Pulmosan Safety Equip. Corp.
Record Industrial Co.
Ricogel Textile Corp.
Record Industrial Co.
Ricogel Textile Corp.
Bochester Safety Equip. Ca., Inc.
Safety Chothing & Equip. Co.
Safety First Supply Co.
Sealisbury, W. H., & Co.
Selentific Industrial Supply Co.
Searjeant Metal Products Inc.
See Safety Prod. Co.
Searjeant Metal Products Inc.
Seo Safety Prod. Co.
Standard Glove Co.
Standard Glove Co.
Standard Safety Equipment Co.
Surety Rubber Co.
United States Rubber Co.
Wash Rite Ca., Inc.
Wilson Rubber Co.
Div. of Becton, Dickinson & Co.

Guards, Finger Forster Mfg. Co.

Guards, Foot and Toe

Guards, Foot and Toe
Allied Glore Corp.
Ellwood Safety Appliance Co.
General Scientific Equip. Co.
Holcomb Safety Garment Co.
Industrial Froducts Co.
Industrial Products Co.
Kimball Safety Products Co.
Midwest Glore Co., Inc.
Midwest Glore Co., Inc.
Midwest Glore Co., Inc.
Dispation Co., Inc.
Pulmosan Safety Equip. Corp.
Recee Wooden Sole Shoc Co.
Bochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Searjeant Metal Products Inc.
Seco Safety Prod. Co.
Standard Glore Co.
Standard Glore Co.
Standard Glore Co.
Wheeler Productive Apparel, Inc.
Characts. Shin

Guards, Shin Guards, Shin

Advance Glove Mfg. Co.
Ellwood Safety Appliance Co.
General Scientific Equip. Co.
Industrial Forducts Co.
Industrial Forducts Co.
Industrial Forducts Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Co., Safety First Supply Co.
Scientific Industrial Supply Co.
Secon Safety Frod. Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

Hand Guards

American Optical Co.
Boyer-Campbell Co.
Bastern Bafety Equip. Co.
General Automation Corp.
General Stlentific Equip. Co.
Holcomb Bafety Garment Co.
Industrial Froducts Co.
Industrial Froducts Co.
Industrial Froducts Co.
Industrial Froducts Corp.
Jomae Inc.
Kennedy-Ingalls, Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Corp.
Plasco Bafety Appliances Co.
Olympic Glove Co., Inc.
Corp.
Plasco Bafety Prod. Co.
Pulmonan Bafety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Secontific Industrial Supply Co.
Secontific Industrial Supply Co.
Beco Safety Prod. Co.
Security Controls, Inc.
Singer Glove Mfg. Co.
Standard Glove Co.
Tamoo, Inc.
Tamoo, Inc.
Tamoo, Inc.
The Medical Co.
Handeller Protective Apparel, Inc.

Handlines

Buhrke, B. H., Co.
Industrial Products Co.
Klein, Mathias, & Sons, Inc.
Macwhyte Wire Rope Co.
Miller Equip. Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

Harness, Industrial Safety

Harness, Industrial Safety
Bashlin, W. M., Co.
Buhrte, B. H., Co.
Buhrte, B. H., Co.
Davis Emergency Equip. Co., Inc.
General Scientific Equip. Co., Inc.
General Scientific Equip. Co., Inc.
Gentex Corp.
Industrial Products Co.
Industrial Safety Belt Co.
Klein, Mathias, & Sons, Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Co.
Mine Safety Appliances Co.
Mine Safety Equip. Co., Inc.
Rochester Safety Equip. Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Standard Glove Co.

Hooks, Safety Belt

Hooks, Safety Belt
Bashlin, W. M., Co.
Buhrke, R. H., Co.
Buhrke, R. H., Co.
Bullard, E. D., Co.
General Selentific Eculp. Co.
Industrial Products Co.
Miller Sculp. Co., Inc.
Miller Sculp. Co., Inc.
Miller Sculp. Co., Inc.
Miller Sculp. Co., Inc.
Stafety Clothing & Eculp. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Standard Glove Co.

Insoles

Goodall Rubber Co.
Industrial Products Co.
Mine Safety Appliances Co.
Record Industrial Co.
Record Rodustrial Co.
Recee Wooden Sole Shue Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

Jackets, Life, Industrial

General Scientific Equip. Co. Gentax Corp. Industrial Products Co. Muter Company Rochester Safety Equip. Co., Inc. Safety Clothing & Equip. Co. Safety First Supply Co.

Lamps, Miners'

Industrial Products Co. Mine Safety Appliances Co. National Mine Service Co. Rochester Safety Equip. Co., Inc.

Lanyards

Anyards
Bashlin, W. M., Co.
Buhrke, B. H., Co.
General Scientific Equip. Co.
Industrial Products Co.
Industrial Safety Belt Co.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Rochester Safety Appliances Co., Inc.
Scient First Supply Co.
Standard Glove Co.
Standard Glove Co.

Leather Preserver, Water Repellent

Dow Corning Corp.
Industrial Products Co.
Miller Equip. Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Standard Glove Co.
Standard Safety Equipment Co.

Leathers, Hand

Leathers, Hand
Advance Glove Mfg. Co.
Allied Glove Corp.
American Optical Co.
Boyer-Campbell Co.
Boyer-Campbell Co.
Geobards
Geologic Co.
Geobards
Geologic Co.
Geologic Co.
Geologic Co.
Industrial Gloves Co.
Industrial Froducts Co.
Kinball Bafety Forducts Co.
Kinball Bafety Forducts Co.
Kinball Bafety Products Co.
Mine Safety Appliances Co.
Olympic Glove Co.
Fine Co.
France Co.
Fran

Leggings

Advance Glove Mfg. Co.
Allied Glove Corp.
American Optical Co.
Holcomb Safety Garment Co.
Industrial Froducts Co.
Industrial Froducts Co.
Industrial Froducts Co.
Industrial Gloves Co.
Industrial Glove Co.
Inc.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Plasco Bafety Prod. Co.
Pulmoan Safety Equip. Corp.
Record Industrial Co.
Savyer-Tower, Inc.
Savyer-Tower, Inc.
Seco Safety Prod. Co.
Sunder, M. L., & Son, Inc.
Standard Blove Co.
Standard Safety Equipment Co.
Wheeler Protective Apparel, Inc.

Linemen's Bags

Bashlin, W. M., Co.
Buhrke, B. H., Co.
Buhrke, E. D., Ce.
Davis Emergency Equip. Co., Inc.
Dorsey, John B., Co.
Goddall Rubber Co.

(section 6-continued)

Industrial Products Co. Klain, Mathias, & Bons, Inc. Midwest Glove Co., Inc. Miller Equip. Co., Inc. Miller Equip. Co., Inc. Miller Equip. Co., Inc. Miller Equip. Co., Inc. Pulmosan Bafety Equip. Corp. Re-Mar Froducts Corp. Recenter Safety Equip. Co., Inc. Balisbury, W. H., & Co. Salisbury, W. H., & Co. Sander Glove Co., Inc. Standard Glove Co.

#### Linemen's Rubber Protective Devices

Davis Emergency Equip. Co., Inc., General Scientific Equip. Co., Inc., Industrial Products Co., Olympic Glove Co., Inc., Pulmosan Safety Equip., Corp., Rochaster Safety Equip., Corp., Rochaster Safety Equip., Corp., Editoury, W. H., & Co., Salisbury, W. H., & Co., Standard Glove Co.,

#### Measuring Device, Foot

Brannock Device Co.

#### Overshoes, Neoprene, Non-Slip

#### Overshoes, Rubber, Non-Slip

Overshoes, Rubber, Non-Silp
Beacon Falls Rubber Footwear
Dorsey, John E., Co.
Goodall Bubber Co.
Industrial Products Co.
Industrial Products Co.
Industrial Products Co.
Industrial Products Co.
H. Childs & Co., Inc.
Midwest Glove Co., Inc.
Olympic Glove Co., Inc.
Olympic Glove Co., Inc.
Rochester Safety Roulp.
Co., Inc.
Rochester Safety Roulp.
Co., Inc.
Scientific Industrial Co.
Sinyder, M. Li., & Sen, Inc.
Standard Glove Co.
Tingley Rubber Corp.

#### Pads, Knee

Pads, Knee

Advance Glove Mig. Co.
General Scientific Equip. Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Garment Co.
Industrial Gloves Co.
Industrial Gloves Co.
Kennedy-Ingalis. Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Olympic Glove Co., Inc.
Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co.,
Pulmosan Safety Equip. Co.,
Safety First Supply Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Singer Glove Mig. Co.
Snyder, M. L., & Son, Inc.
Standard Glove Co.
Standard Safety Equipment Co.

#### Pads, Miners'

General Scientific Equip. Co. Industrial Products Co. Midwest Glore Co., Inc. Mine Safety Appliances Co. New Jersey Safety Equip. Co., Inc. Safety First Supply Co., Inc. Safety First Supply Co.

### Protectors, Arm

Protectors, Arm

Advance Glove Mfg. Co.
Allied Glove Corp.
American Optical Co.
General Scientific Equip. Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Garment Co.
Holcomb Bafety Corp.
Jonae Grown Co.
Holcomb Bafety Products Co.
Holcomb Bafety Products Co.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Mime Safety Appilances Co.
Olympic Glove Co., Inc.
Places Bafety Prod Co.
Pulmonan Bafety Equip. Corp.
Rainfair, Inc.
Record Industrial Co.
Bafety Clothing & Equip. Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scientific Industrial Supply Co.
Standard Glove Co.

#### Protectors, Finger

Advance Glove Mfg. Co. American Optical Co.

General Bandages. Inc.
General Bedentific Equip. Co.
Holcomb Bafety Garment Co.
Industrial Gloves Co.
Industrial Gloves Co.
Industrial Froducts Co.
Johns Marville Sales Corp.
Johns Marville Sales Corp.
Midwest Glove Co., Inc.
Olympic Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Midwest Glove Co.
Safety Appliances Co.
Glove Dividentification Co.
Safety Chothing & Equip. Co.,
Safety Chothing & Equip. Co.
Safety First Supply Co.
Standard Gafety Equipment Co.
Standard Gafety Equipment Co.
Wheeler Frotective Apparel, Inc.
Wheeler Frotective, Dickinson & Co.

#### Protectors, Knee

Protectors, Knee

Advance Glove Mfg. Co.
General Scientific Equip. Co.
Holcomb Safety Garment Co.
Industrial Gloves Co.
Johnson Ladder Shoe Co.
Johnson Ladder Shoe Co., Inc.
Kennedy-Ingalis, Inc.
Midwest Glove Co., Inc.
Midwest Glove Co., Inc.
Mine Bafety Appliances Co.
New Jersey Safety Equip. Co.,
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co.p.
Rochester Safety Equip. Co.
Rochester Safety Equip. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Standard Glove Mfg. Co.
Standard Glove Mfg. Co.
Standard Safety Equipment Co.
Wheeler Protective Apparel, Inc.

#### Protectors, Linemen's

Profectors, Linemen's

Advance Glove Mfg. Co.
Bashlin, W. M., Co.
Charleston Rubber Co.
General Selentific Equip. Co.
Industrial Products Co.
Midwest Glove Co., Inc.
Miller Equip. Co., Inc.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Pulmosan Safety Equip. Co., Inc.
Safety First Supply Co.
Sallsbury. W. H., & Co.
Sallsbury. W. H., & Co.
Sallsbury. W. H., & Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.
Wolverine Shoe & Tanning Corp.

#### Radar Meter

Sperry Microwave Electronics Co.

Rescue Suits

Advance Glove Mfg. Co.
Fyrepel Products, Inc.
Gentex Corp.
Industrial Gloves Co.
Industrial Gloves Co.
Industrial Froducts Co.
Midwest Glove Co., Inc.
Mine Safety Appliances Co.
Minnesota Mining & Mfg. Co.
Olympic Glove Co., Inc.
Rachester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Seco Safety Prod. Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

### Rope Grab, Life Line

Cleveland Ladder Co.
Industrial Products Co.
Macwhyte Wire Rope Co.
Miller Equip. Co., Inc.
Rochester Safety Equip. Co., Inc.
Rose Mfg. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.

### Sandals, Non-Skid

Industrial Products Co.
Record Industrial Co.
Record Industrial Co.
Record Sold Shoe Co.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Sandard Safety Soulpment Co.
Tingley Rubber Corp.

#### Sandals, Shower

Beacon Falls Rubber Footwear General Scientific Equip. Co. Industrial Products Co. Kimball Safety Products Co. New Jersey Safety Equip. Co.

Record Industrial Co.
Recca Wooden Sole Shoe Co.
Recca Wooden Sole Shoe Co.
Rechester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Snyder, M. L., & Son, Inc.
Standard Glove Co.

#### Sandals, Wooden Sole

Sandals, Wooden Sole
General Scientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Kimball Safety Products Co.
New Jersey Safety Equip. Co.
Pulmosan Safety Equip. Co.
Reco. Wooden Sole Shoe Co.
Rochester Safety Equip. Co.. Inc.
Safety Cothing & Equip. Co.. Inc.
Safety Cothing & Equip. Co.
Co. Inc.
Safety Cothing & Equip. Co.
Scientific Industrial Supply Co.
Seco. Safety Prod. Co.
Snyder, M. L., & Son, Inc.
Standard Safety Equipment Co.
Standard Safety Equipment Co.

#### Self-Rescuers, Miners'

Mine Safety Appliances Co. Rochester Safety Equip. Co., Inc.

#### Shield, Welding

shield, Welding

American Optical Co.
Boyer-Campbell Co.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co., Inc.
Davis Emergency Equip. Co.
Frommelt Industries
General Scientific Equip. Co.
Industrial Products Co.
Kimball Safety Products Co.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Planear Scientific Corp.
Planear Scientific Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co. Inc.
Safety First Supply Co.
Sellstrom Mfg. Co.
Standard Glove Co.
Wheeler Protective Apparel, Inc.

#### Shirts, Anatomical

Mine Safety Appliances Co. Rochester Safety Equip. Co., Inc.

#### Shoe Preserver, Water Repellent

Dow Corning Corp.

Hy-Test Safety Shoes Div.,
International Shoe Co.,
Industrial Products Co.,
Miller Equip. Co., Inc.
Rachister Safety Equip. Co., Inc.
Safety First Supply Co.,
Standard Safety Equipment Co.

#### Shoes, Conductive

Conductive Hospital Accessories Corp. Hy-Test Safety Shoes Div., International Shoe Co. Lehigh Safety Shoe Co. MeAn, Thom., Safety Shoe Div. Bochester Safety Equip. Co., Inc.

#### Shoes, Leather, Linemen's

Bashlin, W. M., Co.
Hy-Test Safety Shoes Div.,
International Shoe Co.
Olympic Glove Co., Inc.
Record Industrial Co.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Wolverine Shoe & Tanning Corp.

#### Shoes, Non-Sparking

Hy-Test Safety Shoes Div.,
International Shoe Co.,
Inc. Age Safety Shoe Div.,
H. Childs & Co., Inc.
McAn Thon, Safety Shoe Div.,
Record Industrial Co.
Receo Wooden Sole Shoe Co.
Rochester Safety Equip. Co., Inc.
Wolverine Shoe & Tanning Corp.

#### Shoes, Orthopedic, Wooden Sole

Industrial Products Co.
Karel First Ald Supply Co.
Record Industrial Co.
Record Wooden Sole Shoe Co.
Rochester Safety Equip. Co., Inc.

#### Shoes, Rubber, Safety Toe

Shoes, Rubber, Safety Toe
Advance Glore Mfg. Co.
Beacon Falls Rubber Footwear
General Scientific Equip. Co.
Goodall Rubber Co.
Hoden Hard Scientific Equip. Co.
Hoden Hard Safety Shoe Div.,
H. Childs & Co., Inc.
Lehigh Safety Shoe Co.
Olympic Glore Co., Inc.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Scientific Industrial Supply Co.
Striper M. L., & Son, Inc.
Standard Glove Co.,
Standard Glove Co.,
Standard Glove Co.

(section 6-continued)

Shoes, Safety Toe

Shoes, Safety Toe

Bone-Dry Shoe Mg. Co.

Bronson Shoe Co.

General Scientific Equip. Co.

General Scientific Equip. Co.

General Scientific Equip.

Haus of Kraus

Hy-Test Safety Shoes Div.

International Shoe Co.

International Shoe Mg. Corp.

Lehigh Safety Shoe Div.

Olympic Glove Co., Inc.

Record Industrial Co.

Recoe Wooden Sole Shoe Co.

Rochester Safety Equip. Co., Inc.

Safety First Shoe Co.

Standard Glove Co., Inc.

Standard Glove Co., Inc.

Standard Glove Co., Inc.

Standard Glove Co., Inc.

Standard Glove Co.

Wolverine Shoe & Tanning Corp.

Shoes, Women's

NOCES, WOMEN'S
Hy-Test Safety Shoes Div.,
International Shoe Co.
Iron Age Safety Shoe Div.,
H. Childs & Co., Inc.,
McAn, Thom, Safety Shoe Div.,
Record Industrial Co.
Reces Wooden Sole Shoe Co.
Rochester Safety Equip. Co., Inc.
United States Kubber Co., Inc.

Shoes, Wooden Sole

shoes, Wooden Sole
General Scientific Equip. Co.
Holoomb Safety Garment Co.
Karel First Aid Supply Co.
Karel First Aid Supply Co.
Klimball Safety Products Co.
Pulmosan Safety Equip. Corp.
Record Industrial Co.
Record Wooden Sole Shoo Co.
Rechester Safety Equip. Co., Inc.
Safety First Safety Sequip. Co., Safety First Safety Sequip. Co.
Safety Saf

Sleeves, Linemen's Rubber

Sleeves, Linemen's Rubber Charleston Rubber Co.
Charleston Rubber Co.
Davis Emergency Equip. Co.,
Goodall Rubber Co.
Goodall Rubber Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Record Industrial Co.
Record Industrial Co.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Selentific Industrial Supply Co.
Secientific Industrial Supply Co.

Sleeves, Protective

Advance Glove Mfg. Co.
Aliay Mfg. Co., Inc.
Allied Glove Corp.
Comparison Optical Co.
Description Eubber Co.
Expression Eubber Co.
Expression Eubber Co.
Expression Eubber Co.
Holcomb Safety Garment Co.
Industrial Gloves Co.

Industrial Products Co.
Johns-Manville Sales Corp.
Jomae Inc.
Kennedy-Ingailis, Inc.
Kimbail Safety Products Co.
Mine Safety Appliances Co.
Olympic Glove Co., Inc.
Place Safety Prod. Co.
Place Safety Prod. Co.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Safety First Supply Co.
Safety First Supply Co

Soles, Shoe, Non-Slip

Soles, Shoe, Non-Sup
American Biltrite Rubber Co.
Bearfoot Sole Co.
Cambridge Rubber Co.,
Vul-Cork Sole Div.
Emerson, J. H., Co.
Goodyear Tire & Rubber Co.,
Gro-Cord Rubber Co.,
Gro-Cord Rubber Co.
Industrial Products Co.
Quabaug Bubber Co.
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Standard Glove Co.

Static Ground Device, Personnel

Legge, Walter G., Co., Inc. Rochester Safety Equip. Co., Inc.

Steel Toes, Safety Shoes

Beacon Falls Rubber Footwear
General Scientific Equip. Co.
Goodall Rubber Co.
Iron Age Safety Shoe Div.,
H. Childs & Co., Inc.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.
New Jersey Safety Equip. Co.
Olympic Glove Co., Inc.
Recee Wooden Sole Shoe Co.
Recee Wooden Sole Shoe Co.
Safety Box Too Co.

Straps, Safety

Bashin, W. M., Co.
Industrial Products Co.
Industrial Safe'ty Belt Co.
Klein, Mathias, & Sons, Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Mine Safety Appliances Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Standard Glove Co.

Tarpaulins, Plastic

larpannis, Plastic
American LaFrance,
Div. of Sterling Precision Corp.
Frommelt Industries
Industrial Glores Co.
Industrial Products Co.
Kennedy-Ingalis, Inc.
Plastimary Corp.
Rochester Safety Equip. Co., Inc.
Scientific Industrial Supply Co.
Seco Safety Prod. Co.

Snyder, M. L., & Son, Inc. Wheeler Protective Apparel, Inc.

Toe Guarda

Goe Guards

Eliwood Safety Appliance Co.
General Scientific Equip. Co.
Industrial Glores Co.
Industrial Glores Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Olympic Glore Co., Inc.
Recee Wooden Sole Shoe Co.
Recee Wooden Sole Shoe Co.
Recee Wooden Sole Shoe Co.
Safety Clothing & Equip. Co., Inc.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Scientific Industrial Supply Co.
Scarlent Metal Products Inc.
Standard Glore Co.

Uniforms, Industrial

Advance Give Mfg. Co.
Industrial Gloves Co.
Industrial Products Co.
Institute of Industrial Launderers
Record Industrial Co.
Rochester Safety Equip. Co., Inc.
Worklon Inc.

Vests, Protective

Vests, Protective
Advance Glove Mg. Co.
Davis Emergency Equip. Co., Inc.
Gentex Corp.
Holosomb Sarger Garment Co.
Industrial Products Co.
Industrial Products Co.
Kimball Safety Products Co.
Midwest Glove Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co., Sandard Glove Co.
Standard Glove Co.
United States Rubber Co.
Wheeler Protective Apparel, Inc.

Wall Grips

Industrial Products Co. Rochester Safety Equip. Cu., Inc. Safety First Supply Co.

Welders' Protective Equipment

## Section 7 Materials Handling

Alarms, Truck and Equipment, Back-Up

Atkinson Dynamics Bullard, E. D., Co. Industrial Products Co. Safety First Supply Co

**Barrel** Lifters

Barrel Lifters

Baker Industrial Trucks,
Dis. of Otts Elevator Co,
Economy Engineering Co.
Elwell-Parker Electric Co,
Industrial Products Co.
Merrill Brothers
Morse Mfg. Co., Inc.
Renfroe, J. C., & Sons, Inc.
Rechester Safety Equip Co., Inc.
Safety First Supply Co.
Searjeant Metal Products Inc.
West Bend Equip. Corp.

Barrel and Drum Movers

Sarret and Drum Movers
Economy Engineering Co.
Industrial Products Co.
Moustrial Products Co.
New Jersey Safety Equip. Co.
New Jersey Safety Equip. Co.
Renfroe, J. C., & Sons, Inc.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
West Bend Equip. Corp.
Witt Cornlece Co.

Barrel Stands

Economy Engineering Co.
General Scientific Equip. Co.
Morse Mg. Ca., Inc.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co., Sarjeant Metal Products Inc.
West Bend Equip. Corp.

Blockers, Mine Car

General Scientific Equip. Co. Industrial Products Co. New Jersey Safety Equip. Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

Blockers, Railroad Car

Aldon Company
General Scientific Equip. Co.
Industrial Products Co.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

**Bottle Carriers** 

Fisher Scientific Co.
Fyrepel Products, Inc.
General Scientific Equip. Co.
Industrial Products Co.
Kennedy-Ingalis, Inc.
Morse Mig. Co., Inc.

New Jersey Safety Equip. Co. Protectoscal Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

**Bottle Crushers** 

Laduby Co., Inc. New Jersey Safety Equip. Co., Rochester Safety Equip. Co., Inc.

**Buckets**, Elevator

Baker Industrial Trucks, Div. of Otis Elevator Co. Bil-Jax, Inc. Link-Belt Co.

**Buckets**, Hoisting

Bil-Jax, Inc.
Buhrke, R. H., Co.
Link-Belt Co.
Re-Mar Products Corp.
Safety First Supply Co.

**Buckets**, Rubber

Cauchotas Industries, Inc.
Fisher Scientific Co.
General Scientific Co.
Industrial Products Co.
Industrial Products Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Snyder, M. L., & Soo, Inc.

(section 7-continued)

#### Cable Wire

Bethlehem Steel Co. Macwhyte Wire Rope Co. National Mine Service Co.

#### Car Door Opener

General Scientific Equip. Co. Industrial Products Co. New Jersey Safety Equip. Co. Bochester Safety Equip. Co., Inc. Safety First Supply Co.

### Car, Hopper Closer

General Scientific Equip. Co. Industrial Products Co. New Jorsey Safety Equip. Co. Safety First Supply Co.

#### Car, Spotters

Industrial Products Co.
Link-Belt Co.
National Mine Service Co.

#### Carboy Drainer

Fisher Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
New Jersey Safety Equip. Co.,
New Jersey Safety Equip. Co.,
Inc.
Safety First Supply Co.
Safety First Supply Co.
Standard Safety Equipment Co.
West Bend Equip. Corp.

#### Carboy, Plastic

Fisher Scientific Co.
Industrial Products Co.
New Jersey Bafety Equip. Co.
Rochester Bafety Equip. Co., Inc.
Safety First Supply Co.

Carboy Tiller
Economy Engineering Co.
Fisher Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
Morse Mfg. Co., Inc.
New Jersey Safety Equip. Corp.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety First Science Co.
Safety First Science Co.
Safety First Science Co.
Safety First Mg. Co.
Safety First Mg. Co.
Co.
West Bend Equip. Corp.

### Carboy Truck

Arboy Truck
Fisher Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
Morse Mfg. Ce., Inc.
New Jersey Safety Equip. Co.
Pulmosan Bafety Equip. Co.,
Eachester Safety Equip. Co., Inc.
Safety First Supply Co., Inc.
Safety First Supply Co., Inc.

#### Carriers, Cylinders

Darrers, Cylinders

Baker Industrial Trucks,
Div. of Otis Elerator Co.
Flisher Scientific Co.
General Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
Karel First Aid Supply Co.
Morse Mfg. Co., Inc.
New Jersey Safey Equip. Co.
Rochester Safety Equip. Co.
Bafety First Supply Co.

#### Carriers, Drum and Barrel

Carriers, Drum and Barrel
Baker Industrial Trucks,
Div. of Otis Elevator Co.
General Scientific Equip. Co.
Industrial Products Co.
Link-Belt Co.
Morse Mfg. Co., Inc.
Morse Mfg. Co., Inc.
New Jersey Safety Equip. Co.
Renfroe, J. C., & Sons, Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Uhrden, Inc.
West Bend Equip. Corp.

#### Chain

Campbell Chain Co.
Columbus McKinnon Chain Corp.
Link-Belt Co.
McKay Co.
National Mine Service Co.
Safety First Supply Co.
Taylor, B. G., Chain Co., Inc.

#### Chain, Coil

American Chain Div.,
American Chain & Cable Co., Inc.
Campbell Chain Co.
Columbus McKinnon Chain Corp.
McKay Co.
National Mine Service Co.
Zaylor, B. G., Chain Co., Inc.

#### Chains, Magnetic

American Chain Div., American Chain & Cable Co. Inc. Link-Belt Co. McKay Co. Taylor, S. G., Chain Co., Inc.

#### Chain, Spark Resisting

Ampco Metal, Inc. Link-Belt Co. McKay Co. Taylor, S. G., Chain Co., Inc.

#### Chains, Sling

Chains, Sling
American Chain Div..
American Chain & Cable Co., Inc.
Campbell Chain Co.
Columbus McKinnon Chain Corp.
Industrial Products Co.
Jones & Laughlin Steel Corp.
McKay Co.
Rochester Safety Equip. Co., Inc.
Taylor, S. G., Chain Co., Inc.

#### Chairs, Safety Boatswain

Bil-Jax, Inc.
Mine Safety Appliances Co.
Patent Scaffolding Co., Inc.
Safety First Supply Co.

#### Chocks, Wheel

Aldon Company Bil-Jax, Inc. Calumes Steel Castings Corp. Industrial Products Co. Kensico Mig. Co., Inc., Never-Stip Safety Clamp Div. New Jersey Safety Equip. Co. Judicial Company Co. Truck Equip. Co., Inc.

#### Clamps, Cable

Industrial Products Co.
National Mine Service Co.
New Jersey Safety Equip. Co.
Newco Mfg. Co., Inc.

#### Clamps, Plate Lifting

Kensico Mfg. Co., Inc., Never-Slip Safety Clamp Div.

#### Clamps, Rail

Industrial Products Co.
New Jersey Safety Equip. Co.
Renfroe, J. C., & Sons, Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

#### Clamps, Wire Rope

Clamps, Wire Rope

American Chain & Cable Co., Inc.
American Logging Tool Corp.
Broderick & Bascom Rope Co.
Canton Mar. Co. Dr.,
Croeby-Laughlin Dry.
Croeby-Laughlin Co.
Logging Tool Co.
Jones & Laughlin Steel Corp.
Klein, Mathias, & Sons, Inc.
Macwhyte Wire Rope Co.
National Mine Service Co.
New Jersey Safety Equip. Co.
Newo Mar. Co., Inc.
Wire Rope Corp. of America, Inc.

### Connectors, Cable

Link-Belt Co. Macwhyte Wire Rope Co. National Mine Service Co. Pyle-National Co.

#### Connectors, Electrical

Ericson Mfg. Co. National Mine Service Co. Pyle-National Co.

#### Connectors, Link

Columbus McKinnon Chain Corp. Crosby-Laughlin Div., Sub. of American Hoist & Derrick Co.

### Connectors, Wire Rope

Crosby-Laughlin Div.,
Sub. of American Hoist & Derrick Co.
Industrial Products Co.
Macwhyte Wire Rope Co.
National Mine Service Co.

#### Crane, Safety Warning Device

Dillon, W. C., & Co., Inc. Electro-Alarm Safety Devices Industrial Products Co. Safety First Supply Co.

Industrial Products Co.
Magline Inc.
Magnesium Co. of America
Safety First Supply Co.
Searjeant Metal Products Inc.

#### Dock Shelter

Frommelt Industries

#### **Drum Fittings**

Jordan Corp. Morse Mfg. Co., Inc. New Jersey Safety Equip. Co.

#### **Drum Openers**

Industrial Products Co. Jordan Corp. Merrill Brothers Morse Mig. Co., Inc. New Jersey Safety Equip. Co. Safety First Supply Co.

#### Elevator, Personnel Demountable

Hawkeye Products Corp.

#### Hoists, Chain

Wright Hoist Div.
American Chain & Cable Co., Inc.
Harrington Co.
Jones & Laughlin Steel Corp.
Robbins & Myers, Inc.

Wright Hoist Div.
American Chain & Cable Co., Inc.
Harrington Co.
Jones & Laughlin Steel Corp.
Robbins & Myers, Inc.

#### Hooks, Hoisting

400ks, Holsting
Buhrke, B. H., Co.
Columbus McKinnon Chain Corp.
Macwhite Wire Rope Co.
McKay Co.
New Jersey Safety Equip. Co.
Newson Mfg. Co., Inc.
Safety First Supply Co.
Taylor, S. G., Chain Co., Inc.
Wire Rope Corp. of America, Inc.

#### Hooks, Safety

Hooks, Safety

Bashlin, W. M., Co.
Buhrko, B. H., Co.
Buhrko, B. H., Co.
Buhrko, E. D., Co.
Crosby-Laughlin Div.,
Sub. of American Holst & Derrick Co.
General Scientific Equip. Co.
Industrial Products Co.
Klein, Mathias, & Sons, Inc.
Macchyre Wire Rope Co.
McKsy Co.
McKsy Co.
McKsy Co.
Line, Co.
McKsy Co.
McKsy Co.
Line, Co.
McKsy Co.
Line, Co.

#### Inclinators, Carboy

Fisher Scientific Co. General Scientific Equip. Co. Industrial Products Co. New Jersey Safety Equip. Co. Pulmosan Safety Equip. Corp.

#### Insulated Safety Links

Bullard, E. D., Co. Industrial Products Co.

#### Lifting Equipment, Industrial

Lifting Equipment, Industrial

Baker Industrial Trucks,
Div. of Otis Elevator Co.
Ballymore Co.
Ballymore Co.
Ballymore Co.
Ballymore Co.
Ballymore Co.
Ballymore Co.
Bulletian Hoist & Derrick Co.
Bunches Co.
Bu

#### Line Construction Equipment and Tools

Industrial Products Co.
Miller Equip. Co., Inc.
Petersen Engineering Co., Inc.
Re-Mar Products Corp.
Safety First Supply Co.
Traffic Equip. Co.
Truck Equip. Co.

#### Load Binders

American Logging Tool Corp.
Canton Mfg. Co.
Crosby-Laughlin Div.,
Sub. of American Hoist & Derrick Co.
Newco Mfg. Co., Inc.

(section 7-continued)

#### Materials Handling Devices

Materials Handling Devices
Baker Industrial Trucks,
Div. of Otta Elevator Co.
Ballymore Co.
Otta Elevator Co.
Ballymore Co.
Sub. of American Hoist & Derrick Co.
Dillon, W. C., & Co., Inc.
Economy Engineering Co.
Elwell-Parker Electric Co.
Frommelt Industries
Hamilton Tool Co.
Handling Devices Co., Inc.
Industrial Products Co.
Link-Belt Co.
Magline Inc.
Magline Inc.
Merrill Broto, of America
Merrill Broto, of America
Merrill Broto, of Merica
Merrill Broto, Toe.
Roblins & Myers, Inc.
Roblins & Myers, Inc.
Roblins & Myers, Inc.
Satety First Supply Co.
Satety First Supply Co.
Satety First Supply Co.
Sunding Fibre Co., Inc.
Fruck Edupp. Co.
Unidon, Inc.

#### Movers, Railway Car

Aldon Company
American Logging Tool Corp.
Crosby-Laughlin Div.,
Sub, of American Holst & Derrick Co.,
Industrial Products Co.,
Link-Belt Co,
National Mine Service Co.,
Safety First Supply Co.

#### Racks, Barrel

Bethlehem Steel Co.
Economy Engineering Co.
Industrial Products Co.,
Morse Mfg. Co., Inc.
New Jersey Safety Equip. Co.
West Bend Equip. Corp.

#### Rail Punch

Mine Safety Appliances Co.

#### Ramps and Runways

Magline Inc. Safety First Supply Co.

#### Reducers, Speed Link-Belt Co.

Reels, Welding Hose

#### United Specialties, Inc.

Reels, Wire

## National Mine Service Co. United Specialties, Inc.

DeVilbiss Co. Ingersoll-Rand Co. Safety First Supply Co.

Air Ejectors
Allied Witan Co., Inc.
Ingeroll-Rand Co.
Littell, F. J., Machine Co.,
Vac-U-Mation Div.
Mine Safety Appliances Co.
Schrader's, A., Bon.,
Div. of Scovill Mig. Co., Inc.

#### Bags, Linemen's Tools

Bashlin, W. M., Co.
Buhrke R. H., Co.
Buhrke R. H., Co.
Davis Emergency Equip, Co., Inc.
Industrial Products Co.
Klein, Mathias, & Sons, Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Miller Equip. Co., Inc.
Safety First Supply Co.
Scientific Industrial Supply Co.
Standard Glove Co.

#### Beryllium Non-Sparking Tools

Ampeo Metal, Inc.
General Scientific Equip. Co.
Industrial Products Co.
Ingersoil-Rand Co.
New Jersey Safety Equip. Co., Rochester Safety Equip. Co., Inc.
Rose Mfg Co.
Scientific Industrial Supply Co.

### Carton Openers

Rochester Safety Equip Co., Inc. Scientific Industrial Supply Co.

#### Chisel Grips

General Scientific Equip. Co. Industrial Products Co. Rochester Safety Equip. Co., Inc. Rose Mfg. Co.

#### Rope, Barrier (Plastic)

#### Rope, Wire

Rope, Wire

American Chain & Cable Ca., Inc.
Bethlehem Steel Co.
Broderick & Bascom Rope Co.
Colorado Fuel & Iron Corp.,
Widwire-Spencer Steel Div.
Industrial Freducts Co.
Industrial Freducts Co.
Matonal Mins Service Co.
Union Wire Rope Corp.,
Sub. of Armoo Steel Corp.
Wire Rope Corp. of America, Inc.

### Rope, Wire, Plastic Coated

Macwhyte Wire Rope Co.

## Shock-Proof Steering Wheels for Lift Trucks

#### Slings, Chain

American Chain Div.

American Chain & Cable Co., Inc.
Campbell Chain Co.
Columbus McKinnon Chain Corp.
Industrial Products Co.
Jones & Laughlin Steel Corp.
McKay Co.
Taylor, S. G., Chain Co., Inc.

#### Sling Protectors

#### Slings, Wire Rope

Sings, Wire Rope
American Chain & Cable Co., Inc.
Bethlehem Steel Co.
Brethlehem Steel Co.
Brederick & Basons Rope Co.
Colorado Fuel & Iron Corp.
Wickwire-Senencer Steel Div.
Industrial Products Co.,
Jones & Laughlin Steel Corp.
Lowery Bros., Inc.
Macwhite Wire Rope Co.
Newco Mfg. Co., Inc.
Union Wire Rope Corp.
Union Wire Rope Corp.
Wire Rope Corp. of America, Inc.

#### Slings, Woven Wire

Cambridge Wire Cloth Co. Jones & Laughlin Steel Corp.

Macwhyte Wire Rope Co. Union Wire Rope Corp., Sub. of Armon Steel Corp.

### Tension Stringing Equipment, Wire

Dillon, W. C., & Co., Inc. Petersen Engineering Co., Inc.

#### Tire Chain and Accessories

American Chain Div.,
American Chain & Co., Inc.
Columbus McKinnon Chain Corp.
Taylor, S. G., Chain Co., Inc.

#### Trucks, Portable Hand

Trucks, Fortable Hand
Economy Engineering Co.
Fisher Scientific Co.
Fisher Scientific Co.
Hamilton Tool Co.
Industrial Products Co.
Magine Inc.
Magnesium Co.
Magnesium Co.
Magnesium Co.
Magnesium Co.
Magnesium Co.
Morse Mfg. Co., Inc.
New Jersey Safety Equip. Co., Inc.
Socientes Safety Equip. Co., Inc.
Unriden, Inc.
Unriden, Inc.
West Hend Equip. Corp.
Wilder Mfg. Co., Inc.

#### Trucks, Safety Steps

Bullard, E. D., Co.
Buttin Steel Products, Inc.
Cotterman, I. D.
Industrial Products Co.,
Industrial Products Co.,
Industrial Products Co.,
Industrial Products Co.,
Ioc. Away Truck Mfg., Co., Ioc.
Safety First Supply Co.,
Truck Equip. Co.

#### Wheel Blocks, Truck

Bil-Jax, Inc. Calumet Steel Castings Corp. Industrial Products Co. New Jersey Safety Equip. Co.

#### Wire Rope Fittings

Wife Kope Fittings
American Chain & Cable Co., Inc.
Bishishiem Size! Co.
Broderick & Bascom Rope Co.
Crosby-Laughlin Div.,
Sub. of American Hoist & Derrick Co.
Jones & Laughlin Steel Corp.
Lowery Bros., Inc.
Macwhyte Wire Rope Co.
Newco Mfg. Co., Inc.,
Wire Rope Corp. of America, Inc.

## Section 8 Machine Operation and Guarding

Safety First Supply Co. Tameo, Inc. Tool & Mfg. Co., Inc.

#### Clamps

Merrill Brothers Renfroe, J. C., & Sons, Inc.

#### Clamps, Sockets and Eyebolts

Crosby-Laughlin Div., Sub. of American Hoist & Derrick Co.

#### Clamps, Wood

Charleston Rubber Co.

#### Cords, Electric

Ericson Mfg. Co. National Mine Service Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

#### Cords, Extension

#### Covers, Machine, Plastic

Rochester Safety Equip. Co., Inc. Standard Glove Co. Wheeler Protective Apparel, Inc.

#### Cutters, Cable

Industrial Products Co. Mine Safety Appliances Co.

#### Cutters, Wire Rope

Industrial Products Co.

#### Drill Table, Safety

Electrode Holders

Fibre-Metal Prod. Co. General Scientific Equip. Co. Standard Glove Co.

#### **Elevating Table**

Hamilton Tool Co.

## **Explosion-Proof Switches**

## Feeders, Punch Press

Industrial Froducts Co.
Littell, F. J., Machine Co.,
Vac-U-Mation Div.
New Jersey Safety Equip. Co.
Searjeant Metal Products Inc.

#### Gage Glasses Sellstrom Mfg. Co.

Grinders, Tool

Ingersoll-Rand Co.

### **Guard Materials**

Globe Co., Products Div. Safety First Supply Co.

#### Guard, All-Steel, Corner

Globe Co., Products Div. New Jersey Safety Equip. Co.

#### **Guards for Edged Tools**

Bashlin, W. M., Co. Buhrke, B. H., Co. Safety First Supply Co.

#### Guards, Fan

Industrial Gloves Co.
New Jersey Bafety Equip. Co.
Rochester Bafety Equip. Co.,
Safety Clothing & Equip. Co.
Safety First Supply Co.

(section 8-continued)

Guards, Genr Searjeant Metal Products Inc.

Guards, Grinders, Portable Boger-Campbell Co.
Industrial Products Co.
Morrison Products, Inc.
New Jersey Safety Equip. Co.
Pulmosan Safety Equip. Cop.
Rechester Safety Equip. Cop.
Safety First Supply Co.

Guards, Grinding Wheel Guards, Grinding Wheel
Boyse-Campbell Co.
Carroll Pressed Metal, Inc.
Industrial Products Co.
Junkin Safety Appliance Co., Inc.
Morrison Products, Inc.
New Jersey Safety Equip. Corp.
Pulmocan Safety Equip. Corp.
Rochester Safety Equip. Corp., Inc.
Safety First Equip. Co., Inc.
Safety First Equip. Co.
Safety First Equip. Co.
Safety Safet

Guards, Guide Pin Boyer-Campbell Co. Central Safety Equip. Co. New Jersey Safety Equip. Co. Pulmocan Safety Equip. Corp. Rochester Safety Equip. Co., Inc. Searjeant Metal Products Inc. Wissman Mfg. Co.

Guards, Jointer Industrial Products Co.
New Jersey Safety Equip. Co.
Peterson, B. E., Co.
Pulmosan Batety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety First Supply Co.

Guards, Kick Press New Jersey Safety Equip. Co. Pulmosan Safety Equip. Corp. Rochester Safety Equip. Co., Inc. Safety Ciothing & Equip. Co., Inc. Safety First Supply Co. Searjeant Metal Products Inc.

Guards, Lathe Industrial Products Co. Pulmosan Safety Equip. Corp. Safety First Supply Co.

Ericson Mfg. Co. Industrial Products Co. New Jerney Safety Equip. Co., Pulmosan Safety Equip. Corp.

Guards, Machine General Automation Corp.
General Automation Corp.
General Automation Corp.
General Automation Corp.
Industrial Products Co.
Joslin, Harbert A., Co.
Pulmosan Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Searjeant Metal Products Inc.
Security Controls, Inc.

Guards, Planer Industrial Products Co. Pulmosan Safety Equip. Corp.

Guards, Platen Press General Automation Corp. Pulmosan Safety Equip. Corp. Security Controls, Inc.

Guards, Portable Lamp Browne, Stewart B., Mrg. Co., Inc. Eriction Mrg. Co. Inc. Eriction Mrg. Co. Inc. Industrial Products Co. McGill Mrg. Co., Inc. Pulmasan Safety Equip. Corp. Rochester Safety Equip. Co., Inc.

Guards, Power Press Guards, Power Press
American Allusfe Co. Inc.
General Automation Corp.
Junkin Safety Appliance Co., Inc.
New Jersey Safety Equip. Co.
Positive Safety Mrg. Co.
Positive Safety Faulp. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co., Inc.
Safeguard Mrg. Co.
Safety Clothing & Equip. Co.
Safety Clothing & Equip. Co.
Schrader's. A., Sea
July of Safety Frod.
Secon Safety Prod.
Secon Safety Prod.
Secon Safety Prod. Co.
Wissman Mig. Co.

Guards, Power Shear New Jersey Safety Equip, Co., Pulmosan Safety Equip, Corp., Schrader's, A., Son, Div. of Scovill Mfg. Ca., Inc. Scarjeant Metal Products Inc.

Guards, Saw FURITIES, SRW
Buhrten, B. H., Co.
Central City Machine & Tuel Co.
Dewalt Div. AMF
Industrial Products Co.
Joslin, Herbort A., Co.
New Jersey Safety Equip. Co.
Peterson, B. E., Co.
Peterson, B. E., Co.
Corp.
Fulmonan Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety First Supply Co.

Guards, Shaper Industrial Products Co.
Peterson, R. E., Co.
Pulmean Safety Equip. Corp.
Safety Clothing & Equip. Co.
Safety First Supply Co. Guards, Wire

Globe Co., Products Div. Pulmosan Safety Equip. Corp.

Holders, Soldering Irons, Adjustable Wilder Mfg. Co., Inc.

Keys, Safety Chuck Lummis Mfg. Co. Osborn Mfg. Co.

Knives, Safety Ampeo Metal, Inc.
Flash Mfg. Co.
Industrial Products Co.
Miller Equip. Co., Inc.
New Jersey Sefety Equip. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.

Lamp, Adjustable Industrial Products Co. Karel First Aid Supply Co. Luzo Lamp Corp. Swivelier Co., Inc.

Lamp, Electric Industrial Products Co.
Karel First Aid Supply Co.
Large Lamp Department,
General Electric Co.
Luxo Lamp Corp.
National Mine Service Co.
Safety First Supply Co.

Lamps, Extension Browne, Extensions
Browne, Stawart B., Mfg. Co., Inc.
Ericson Mfg. Co.,
Industrial Products Co.,
LUED Lamp Corp.,
National Mine Service Co.,
Pyle-National Co.,
Rochester Safety Equip. Co., Inc.

Lamps, Portable Electric Lamps, Portable Electric
Browne, Stowart Is., Mfg. Co., Inc.
Clean Sweep Co.
Davis Emergency Equip. Co., Inc.
Electric Cord Co.
Lord Co.
L

amps, Safety
Browns Exewart R., Mfg. Co., Inc.
Carposier Mfg. Co.
Darie Emergency Equip. Co., Inc.
Electric Cord Co.
Electric Cord Co.
Hindle Transformer Co., Inc.
Hodustrial Froducts Co.
National Mine Service Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Safety First Supply Co.
Teccar Products Co.
Traffic Equip. Co.
U-C-Lite Mfg. Co.

Lanterns, Carbide Industrial Products Co., Rochester Safety Equip. Co., Inc.

Lanterns, Electric Carpenter Mfg. Co. Davis Emergency Equip. Co., Inc. Industrial Products Co.
National Carbon Co.
Div. of Union Carbide Corp.
Portable Light Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
U-C-Lite Mfg. Co.

Lifters, Vacuum Industrial Products Co.
Littell, F. J., Machine Co.,
Vac-U-Mation Dlv.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co., Inc.
Safety Clothing & Equip. Co.,
Safety First Supply Co.
Searjeant Metal Products Inc.
Standard Glove Co.

Lock-Outs, Electric Switch General Scientific Equip, Co. Industrial Products Co. New Jersey Safety Equip, Co. Safety Clothing & Equip, Co. Searjeant Metal Products Co.

Mauls, Rubber Johnson Ladder Shoe Co., Inc. Safety First Supply Co. Snyder, M. L., & Son, Inc.

Mauls, Wood Safety First Supply Co.

**Non-Sparking Tools** NON-SPARKING 1001S
Ampoe Metal, Inc.
Davis Emergency Equip. Co., Inc.
General Scientific Equip. Co.
Industrial Products Co.
Industrial Products Co.
Ingernoll-Rand Co.
Merrill Brothers
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Safety First Supply Co.

Ohmeters, Safety Hewson Co., Inc. Padlocks Industrial Products Co. Master Lock Co. National Mine Service Co.

Plastics for Shields and Guards Industrial Products Co.
Pioneer Scientific Corp.,
Sub. of Bausch & Lomb Optical Co.
Rochester Safety Equip. Co., Inc.
Scarfeant Metal Products Inc.
Wisser Products, Inc.

Power Machine, Electric Control Security Controls, Inc.

Power Press, Safety Control Kits Searjeant Metal Products Inc.

Pullers, Cable Klein, Mathias, & Sons, Inc. Petersen Engineering Co., Inc.

Pulleys, Fuse Industrial Products Co. National Mine Service Co. Safety First Supply Co.

Reflectors, Lamp Industrial Products Co. Refueling Controls

Hewson Co., Inc. Regulators, Gas Dockson Corp. Fisher Scientific Co. Safety First Supply Co.

Sheet Lifters, Vacuum

Royer-Campbell Co. Industrial Products Co. Littell, F. J., Machine Co., Vac-U-Mation Div. Multifinish Mfg. Co. Safety First Supply Co. Shields, Valve

Industrial Products Co. Tester, Cable Hewson Co., Inc. Mine Safety Appliances Co. National Mine Service Co.

Tool Holsters (Tool Holder) Bashlin, W. M., Co. Buhrke, B. H., Co. Davia Emergency Equip. Co., Inc.

(section 8-continued)

Industrial Products Co. Industrial Safety Belt Co. Klein, Mathias, & Sens, Inc. Miller Equip. Co., Inc. Safety First Supply Co.

Tool, Linemen's

Novis, LABCLINEE S
Bashlin, W. M., Co.
Industrial Products Co.
Klein, Matbias, & Sons, Inc.
Miller Equip. Co., Inc.
National Mine Service Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

Tools, Marking Cunningham, M. E., Co. Industrial Products Co. Safety First Supply Co.

Tools, Non-ferrous Metal

(OOIs, NOD-terrous Metan Ampon Metal, Inc. Beryillum Corp. Industrial Products Co. Ingersoll-Rand Co. New Jensey Safety Equip. Co. Nunis Mfg. Co., Div. of New Plastic Corp. Rochester Safety Equip. Co., Inc. Scientific Industrial Supply Co.

Tools, Safety

Ampoo Metal, Inc.
Beryllium Corp.
Cunningham, M. E., Co.
Davis Emergency Equip. Co., Inc.
Flash Mfg. Co.
Industrial Products Co.
Ingersoil-Rand Co.

New Jersey Bafety Equip. Co. Nupla Mfg. Co., Div. of New Plastic Corp. Osborn Mfg. Corp. Rochester Safety Equip. Co., Inc. Safety First Supply Co. Scientific Industrial Supply Co. Scarleant Metal Froducts Inc. Tool & Mfg. Co., Inc.

**Tool Tester** POW-R-SAFE, Inc.

Torches, Welding Dockson Corp.
General Scientific Equip. Co.
Linde Company,
Div. of Union Carbide Corp.

Mine Safety Appliances Co.

Valves, Air Blast Littell, F. J., Machine Co., Vac-U-Mation Div. Schrader's, A., Son, Div. of Scovill Mfg. Co., Inc.

Valves, Air Blow Schrader's, A., Son, Div. of Scovill Mfg. Co., Inc.

Valves, Gate B-P & C Vaive Div.

American Chain & Cable Co., Inc.

Jordan Corp. Valves, Oxygen Oxygen Equip. & Service Co. Rochester Safety Equip. Co., Inc. Rockwood Sprinkler Co. Safety First Supply Co.

Valves, Safety Bailey, W. M., Co. Coppus Engineering Corp. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

Valves, Steam R-P & C Valve Div.
American Chain & Cable Co., Inc.
Homesteed Valve Mfg. Co.
Jordan Corp.
Bockwood Sprinkler Co.

Valve Wheel Wrench, Spark Proof Industrial Products Co.

Washers, Safety Grinding Wheel Industrial Products Co. Safety Clothing & Equip. Co.

Wrenches, Hopper Car Industrial Products Co. Safety Clothing & Equip. Co. Safety First Supply Co.

Wrenches, Spanner Ampco Metal, Ins.
Rochester Bafety Equip. Co., Inc.
Safety First Supply Co.
Scientific Industrial Supply Co.
Snyder, M. L., & Son, Inc.

## Section 9 Plant Protection

Acid Handling Utensils

Ampco Metal, Inc.
Fisher Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
Karel First Aid Supply Co.
Morse Mfg. Co., Inc.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co.,
Scientific Industrial Supply Co.
Thompson Mfg. Co., Inc.

Alarms, Air Raid

DuKane Corp.
Falcon Alarm Co., Inc.
Federal Sign & Signal Corp.
Gamewell Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

Alarms, Carbon Monoxide

Mine Safety Appliances Co., Rochester Safety Equip Co., Inc. Safety First Supply Co.

Alarms, Combustible Gas

Bullard, E. D., Co. Davis Emergency Equip, Co., Inc. Johnson-Williams, Inc. Johnson-Williams, Inc. Safety Appliances Co. Safety First Supply Co.

Alarms, Fire

Alarins, Fire
Auth Electric Co., Inc.
Edwards Co., Inc.
Edwards Co., Inc.
Federal Alarn Co., Inc.
Federal Sign & Signal Corp.
Fyy-Fyter Co.
Gamewell Co.
Hig Alert Div.
Kidde, Walter, & Co., Inc.
Rochester Safety Equip. Co., Inc.
Rockwood Sprinkler Co., Safety First Supply Co.

Alarms, Ground

Brundee Co.

Alarms, Intrusion

Edwards Co., Inc. Kidde, Walter, & Co., Inc.

Alarms, Smoke

Fyr-Fyter Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

Alarms, Static

Hewson Co., Inc.

Arresters, Flame or Spark

Erickson Products Co. Interstate Precision Products Corp., Big Alert Div. Jordan Corp. New Jersey Safety Equip. Co. Pretectascal Co.

Ash Trays, Industrial

Datenport, A. C., & Sen, Inc. Hornik, Frederick Hornik, Frederick Industrial Products Co. Karel First Aid Supply Co. Safety First Supply Co. Safety First Supply Co. Safety First Supply Co. Standard Industrial Products Co. Standard Industrial Products Co.

Axes, Fire Poles

Axes, Fire Poles
American LaFrance,
Div. of Sterling Precision Corp.
American Logging Tool Corp.
Elkhart Brass Mfg. Co., Inc.
Fyr-Fyter Supply Co., New Jorsey Safety Equip. Co., Inc.
Safety First Supply Co.
Sardey First Supply Co.
Surder, M. L., & Son, Inc.

Batteries

Hornik, Frederick Industrial Products Co. National Carbon Co., Div. of Union Carbide Corp. National Mine Service Co. Safety First Supply Co.

Brooms, Fire Fighting

American LaFrance,
Div. of Sterling Precision Corp.
Fyr-Fyrer Ca.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.

Cans, Safety

Cans, Safety
Continental Can Co.
Eagle Mfg. Co.
Fyr-Fyter Co.
General Scientific Equip. Co.
Industrial Products Co.
Justris Mfg. Co.
Justris Mfg. Co.
Friedland Co.
Friedland Co.
Friedland Co.
Friedland Co.
Friedland Co.
Friedland Co.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Corp.
Rochester Safety Equip. Co.
Safety Clothing & Equip. Co.
Safety First Supply Co.
Safety First Supply Co.
Safety Friedlandstrial Supply Co.
Searleant Metal Products Inc.
Seco Safety Frod. Co.
Snyder, M. Lr. & Son, Inc.
Standard Glove Co.
Witt Cornice Co.

Containers, Explosive Liquid

Industrial Products Co.
Justrite Mfg. Co.
New Jersey Safety Equip. Co.
Protectoseal Co.
Safety First Supply Co.

Covers, Self-Closing

New Jersey Safety Equip. Co. Protectureal Co. Witt Cornice Co.

Detectors, Carbon Monoxide

Petectors, Carbon Monoxide
Daris Emergency Equip, Co., Inc.
General Scientific Equip, Co.
Mine Safety Appliances Co.
Mine Safety Appliances Co.
New Jersey Safety Equip, Co., Inc.
Safety First Supply Co., Safety First Supply Co.
United States Safety Service Co.
United States Safety Service Co.

Detectors, Fire

Detectors, Fire
Cardox Div.,
Chematron Corp.
Edwards Co., Inc.
Fenseal Ins
Fenseal Ins
Co., Go., Inc.
Fenseal Ins
Co., Grinnell Co.,
Grinnell Co.,
Grinnell Co.,
Horstate Frecision Products Corp.,
Big Alert Div.
Ridde, Walter, & Co., Inc.
Pyrotronics,
Div. of Baker Industries, Inc.
Rochester Bafety Eculp. Co., Inc.
Rockwood Bprinkler Co.,
Safety First Supply Co.

Detectors, Gas

American Allasfe Co., Inc.
Bullard, E. D., Co.
Bullard, E. D., Co.
Davis Emergency Equip. Co., Inc.
Johnson-Williams, Inc.
Mine Rafety Appliances Co.
National Mine Service Co.
New Jersey Safety Equip. Co.,
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Stephenson Corp.

Detectors, Ground

Brumles Co.

Detectors, Radiation

Eastman Kodak Co. New Jersey Safety Equip. Co. Nuclear Measurements Corp. Pyrotronies Div. of Baker Industries, Inc. Higgs Nucleonies Corp.

(section 9-continued)

Rochester Safety Equip. Co., Inc. Safety First Supply Co. Staplex Co., Air Sampler Div.

#### Detectors, Smoke

Cahron Div., Corp., Chem. Corp., Chem. Corp., Chemetron Corp., Pyr-Fyter Co., Kidde, Walter, & Co., Inc., Pyrotronica., Div. of Baker Industries, Inc., Rochester Safety Equip. Co., Inc., Safety First Supply Co.

#### Doors, Fire and Service

Kinnear Mfg. Co. Rochester Safety Equip. Co., Inc.

#### Doors, Fire Resistant

Rochester Safety Equip. Co., Inc.

#### Dryers, Fire Hose

American LaFrance,
Div. of Sterling Precision Corp.
Fyr.Fyter Co.
Safety First Supply Co.

#### Electronic Indicating Ground

#### **Explosives Carrier**

Gentex Corp. Mine Safety Appliances Co.

## Faucets, Self-Closing

Industrial Products Co. New Jersey Safety Equip. Co. Protectosal Co. Rochester Safety Equip. Co., Inc. Speakman Company

#### Fire Extinguishers

Fire Extinguishers

American LaFrance,
Div. of Sterling Precision Corp.
Ansul Chemical Co.
Cardoz Div.,
Chemical Co.
Elikhart Brass Mfg. Co., Inc.
Fisher Belantific Co.
Fyr-Fyter Cextinguisher Corp.
Big Aiert Div.
Ridde, Walter, & Co., Inc.
Lee-Der Mfg. Co., Inc.
Lee-Der Mfg. Co., Inc.
National Mine Service Co.,
Protectoseal Co.
Protectoseal Co.
Protectoseal Co.
Protectoseal Co.
Rockwood Sprinier Co.
Bafety Equip. Corp.
Randolph Laboratories, Inc.
Rockwood Sprinier Co.
Bafety First Prod. Corp.
Safety First Prod. Corp.
Safety First Prod. Corp.
Safety First Prod. Corp.
Safety First Prod. Co.
Bearleast Metal Products Inc.
Beco Safety Frod. Co.
Bryder, M. L., & Son, Inc.

#### Fire Extinguisher Recharges and Equipment

Fire Extinguisher Recharges at American LaFrance, Div. of Sterling Precision Corp. Ansui Chemical Co. Sterling Precision Corp. Ansui Chemical Co. Line, Fyr-Fyter Co. General Fire A. Co., Inc. Fyr-Fyter Co. General Fire A. Co., Inc. National Form & Co., Inc. National Form & Co., Inc. National Form System, Inc. National Mine Service Co. Randolph Laboratories, Inc. Red Comet, Inc. Red Comet, Inc. Red Comet, Inc. Safety First Supply Co., Singlety First Supply Co. Scientific Industrial Supply Co. Secondard First Supply Co. State First Firs

#### Fire Extinguisher Foam

Fire Extinguisher Foam
American LaFrance,
Div. of Sterling Precision Corp.
Eikhart Brass Mfg. Co., Inc.
Fisher Scientific Co., Inc.
Fisher Scientific Co.
General Fire Extinguisher Corp.
National Foam System, Inc.
Fulmosan Safety Equip. Corp.
Randolph Laboratories, Inc.
Red Comet. Inc.
Red Comet. Inc.
Rockwood Sprinkler Co.,
Safety First Supply Co., Safety First Supply Co.
Seo Bafety Fred. Co.
Smyder, M. L., & Son, Inc.

#### Fire Extinguisher Seals

ITE EXUNGUISHET Scales
American LaFrance,
Div. of Starling Precision Corp.
Elkhart Brass Mfg. Co., Inc.
Fyr-Fyter Cextinguisher Corp.
General Fire Extinguisher Corp.
Red Comet, Inc.
Rochester Safety Equip. Co., Inc.

Safety First Supply Co. Seco Safety Prod. Co. Snyder, M. L., & Son, Inc.

### Fire Extinguishing Systems

Fire Extinguishing Systems

American LaFrance,
Div. of Sterling Precision Corp.
Annul Chemical Co.
Chemetron Corp.
Fernal Inc.
Chemetron Corp.
Fernal Inc.
Fyr-Fyter Co.
Grinnell Co., Inc.
Hierstate Precision Porducts Corp.,
Big Alert Div.
Kidde, Walter, & Co., Inc.
National Foam System, Inc.
Randolph Laboratories, Inc.
Red Comet, Inc.
Red Comet, Inc.
Rockwood Sprinkier Co.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.

#### Fire Foam Generators

Fire Foam Centrators

American LaFrance,
Div. of Sterling Precision Corp.
Cardox Div.,
Chemetron Corp.
Fyr-Fyter Co.,
National Foam System, Inc.
Nochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Snyder, M. L., & Son, Inc.

#### Fire Hose

American LaFrance,
Div. of Sterling Precision Corp.
Elikhart Brass Mfg. Co., Inc.
Fyr-Fyter Co.
General Fire Extinguisher Corp.
Goodall Rubber Co.
National Foam System, Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Seco Safety Prod. Co.
Suco Safety Prod. Co.
Suco Safety Prod. Co.
United States Rubber Co.

#### Fire Hose Reels

American LaFrance,
Div. of Sterling Precision Corp.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Eikhart Brass Mfg. Co., Inc.
Fyr-Fyter Co.,
General Fire Extinguisher Corp.
Goodall Rubber Co.,
National Foam System, Inc.
Rochester Safety Equip. Co., Inc.
Safety First Bought Co.
Soyder, M. L., & Son, Inc.

#### Fire Hose Accessories

Fire Hose Accessories
American LaFrance,
Div. of Sterling Precision Corp.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Elikhart Brass Mfg. Co., Inc.
Fyr-Fyter Co.
General Fire Extinguisher Corp.
National Foam System, Inc.
Nochester Safety Equip. Co., Inc.
Nochester Safety Food.
Seco. Safety Prod.
Seco. Safety Prod.
Synder, M. L., & Son. Inc.
United States Rubber Co.

#### Fire Ladders, Aluminum

Gre Ladders, Attnimum
Aluminum Ladder Co.
Aluminum Safety Prod. Inc.
American LaFrance,
Div. of Sterling Precision Corp.
Cleveland Ladder Co.
Duo-Safety Ladder Corp.
General Bire Extinguisher Corp.
General Bire Extinguisher Corp.
Fatent Scaffolding Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Werner, R. D., Co., Inc.

#### Fire Ladders, Wood

American Laffrance,
Div. of Sterling Precision Corp.
Cleveland Ladder Cor.
Duo-Safety Ladder Corp.
Fyr-Fyter Cextinguisher Corp.
General Fire Extinguisher Corp.
Hudustrial Products Co., Inc.
Patent Scaffolding Co., Inc.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.

#### Fire Nozzles

American LaFrance,
Div. of Sterling Precision Corp.
Annul Chemical Co.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Elikhart Brass Mfg. Co., Inc.
Eyr-Fyter Co.
General Fire Extinguisher Corp.
Grinnell Co., Inc.
National Foam System, Inc.

#### Fire Pumps

Kire Pumps

American LaFrance,
Div. of Sterling Precision Corp.
Bean John, Div.,
Bean John, Div.,
When the Corp.
Bean John, Div.,
When John Corp.
Bean John Div.
Bean

#### Fire Sirens

Fire Sirens
American LaFrance,
Div. of Sterling Precision Corp.
Edwards Co., Inc.
Federal Sign & Signal Corp.
Fyr-Fyter Cextinguisher Corp.
General Fire Extinguisher Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.

#### Fire Trucks, Industrial

American LaFrance,
Div. of Sterling Precision Corp.
Ansul Chemical Co.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Carlox Div.,
Chemetron Corp.
National Foam System, Inc.
Rochester Safety Equip. Co., Inc.
Seco Safety Prod. Co.
Truck Equip. Co.

### Flame Retardant, Fibre Board

Flamort Chemical Co. Johns-Manville Sales Corp. Rochester Safety Equip. Co., Inc.

### Flame Retardant, Wood

Flamort Chemical Co.

#### Flashlights

rashinghts
Adept Industries, Inc.
Browne, Stewart R., Mfg. Co., Inc.
Framort Chemical Co.
General Scientific Equip. Co.
Hornik, Frederick
Industrial Products Co.
Justries Mfg. Co.
National Carbon Co.,
Dity of Union Carbide Corp.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Tedcar Products Co.

#### Flashlights, Permissible

Flashights, Fermissable
Browne, Stewart B., Mg. Co., Inc.
Carpenter Mg. Co.
Industrial Products Co.
Justrite Mg. Co.
Justrite Mg. Co.
Mine Safety Appliances Co.
National Carbon Co.,
Div. of Union Carbide Corp.
New Jersey Safety Equip. Co.
Safety First Supply Co.

### Floodlights, Emergency

Floodlights, Emergency
American Optical Co.
Carpenter Mfg. Co.
Carpenter Mfg. Co.
Carpenter Mfg. Co.
Crouse-Hinds Co.
Fyr-Fyter Co.
Industrial Products Co.
Linde Company,
Div. of Union Carbide Corp.
McDermott, Julian A., Corp.
New Jerser Safety Equip. Co.
New Jerser Safety Equip. Co.
New Jerser Safety Equip. Co., Inc.
Safety First Supply Co., Inc.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.
Tedcar Products Co.
U-C-Lite Mfg. Co.

#### Fog Guns

American LaFrance,
Div. of Sterling Precision Corp.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Eikhart Beass Mfg. Co., Inc.
Fyr-Fyter Co.
Safety First Supply Co.

#### Fog-Nozzle

FOG.-NOZZIE

American LaFrance,
Div. of Sterling Precision Corp.
Elikhart Brass Mfg. Co., Inc.
Fyr.-Fyter Co.
General Fire Extinguisher Corp.
Rochester Safety Equip. Co., Inc.
Rockwood Sprinkler Co.
Safety First Supply Co.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.

(section 9-continued)

#### Gongs, Sirens, Horns, Signaling Devices

JORGES, SHORES, HOTHS, SIGNAL
Auth Electric Co., Inc.
Edwards Co., Inc.
Edwards Co., Inc.
Fyr-Fyter Co.,
General Fire Extinguisher Corp.
Macchi & Co.,
Matchial Min Service Co.
National Min Service Co.
National Min Service Co.
National Min Service Co.
Safety First Supply Co.
Safety First Supply Co.
Snyder, M. L., & Son, Inc.
Wheeler Protective Apparel, Inc.

#### Grounding Device, Electronic

Brundee Co. Everley, Paul S., Co. Gilbert & Barker Mfg. Co.

#### Hand Pumps

American LaFrance,
Div. of Sterling Precision Corp.
Fisher Scientific Co.
Fyr-Fyter Co.
Frotectoneal Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Tokhelm Corp.

#### Hose, Line

109c, LABE
American LaFrance,
Div. of Sterling Precision Corp.
Fyr-Fyter Co.
Goodall Rubber Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Salisbury, W. H., & Co.
Snyder, M. L., & Son, Inc.

#### Hydraulic Fluid, Fire Resistant

Houghton, E. F., & Co. Shell Oil Co.

#### Hydrogen Analyzer

Davis Emergency Equip. Co., Inc. Fisher Scientific Co., Johnson-Williams, Inc.

#### Indicators, Carbon Monoxide

Davis Emergency Equip. Co., Inc. General Scientific Equip. Co. Mine Safety Appliances Co. National Mine Service Co. New Jersey Safety Equip. Co. Safety First Supply Co. United States Safety Service Co.

#### Indicators, Flammable Vapors

Davis Emergency Equip. Co., Inc. Johnson-Williams, Inc. Mine Safety Appliances Co. New Jersey Safety Equip. Co. Safety First Supply Co.

Davis Emergency Equip. Co., Inc. Johnson-Williams, Inc. Mine Safety Appliances Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

#### Lamps, Emergency

Lamps, Emergency
American Optical Co,
Carpenter Mfg. Co,
Carpenter Mfg. Co,
Davis Emergency Equip. Co., Inc.
Industrial Products Co.
Karel First Aid Supply Co.
McDermott, Julian A., Corp.
Mine Safety Appliances Co.
New Jersey Safety Equip. Co.
Portable Light Co., Inc.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Tedear Products Co.
U-C-Lite Mfg. Co.

#### Lamps, Explosion Proof

Lamings, Expression Froof
Browns, Stewart B., Mg. Co., Inc.
Carpenter Mfg. Co.
Davis Emergency Equip. Co., Inc.
Electric Cord Co.
Justrite Mfg. Co.
Justrite Mfg. Co.
Steric First Aid Supply Co.
New Jersey Safety Equip. Co.
Safety First Supply Co.
U-C-Lite Mfg. Co.

#### Leak Testing Solution

Oxygen Equip. & Service Co.

#### Lighting Emergency

Aghting Emergency
American Optical Co.
Carpenter Mfg. Co.
Clean Sweep Co.
Crouse-Hinds Co.
Electric Cord Co.
Electric Storage Battery Co.,
Exide Industrial Div.
Industrial Products Co.
McDermott, Julian A., Corp.
Fortable Light Co., Inc.
Pyle-National Co.

Rochester Safety Mquip. Co., Inc. Safety First Supply Co. Tedeer Products Co. Traffic Equip. Co. U-C-Lite Mfg. Co.

#### Lighting Units, Portable

Lighting Units, Portable
Browne, Stowart R., Mig. Co., Inc.
Carpenter Mig. Co.
Electric Cord Co.
Electric Cord Co.
Electric Cord Co.
Electric Cord Co.
Fir-Fyter Co.
Industrial Products Co.
Karel First Aid Supply Co.
McDermott, Julian A., Corp.
McGlill Mig. Co., Inc.
Frairie State Prod. Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Surder First Supply Co.
Surder First Supply Co.
Surder M. L., & Son, Inc.
Swiveller Co., Inc.
Tedear Products Co.
U-C-Lite Mig. Co.

#### Lights, Emergency, Battery

American Optical Co.

Carpenter Mig. Co.

Clean Sweep Co.

Clean Sweep Co.

Clean Sweep Co.

Clean Sweep Co.

Electric Storage Battery Co., Inc.

Electric Corn. Co.

Electric Storage Battery Co.,

Luditic Mig. Co.

Karel First Aid Supply Co.,

New Jersey Safety Equip. Co.,

New Jersey Safety Equip. Co.,

Portable Light Co., Inc.,

Rechester Safety Equip. Co.,

Electric Supply Co.,

Suddar, M. L., & Son, Inc.,

Tedcar Products Co.

U-C-Lite Mig. Co.

#### Lights, Emergency Vehicle

Agnis, Emergency Vehicle
Camenter Mfg. Co.
Federal Sign & Signal Corp.
Fyr-Fyter Co.
McDemott, Julian A., Corp.
Fortable Light Co., Inc.
Fyle-National Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.
Tedean Frontiet Co.
Vari-Froducts Co.
Vari-Froducts Co.

#### Lights, Warning

Lights, Warning
Bashlin, W. M., Co.
Brundee Co.
Carpenter Mig. Co.
Carpenter Mig. Co.
Carpenter Mig. Co.
Carpenter Mig. Co.
Largenter Mig. Co.
McDermott, Julian A., Corp.
Pyle-National Co.
Light Co., Inc.
Pyle-National Co.
Largenter Mig. Co.

#### Megaphones, transistor-powered

Antrex Corp. Audio Equip. Co., Inc.

NOZZIES

American LaFrance,
Div. of Sterling Precision Corp.
Bean, John, Div.,
Food Machinery & Chemical Corp.
Eikhart Brass Mfg. Co., Inc.
Fyr-Fyter Co.
National Foom System, Inc.
Rochester Safety Equip. Co., Inc.
Rockwood Sprinkler Co.,
Safety First Supply Co.,
Seco Safety Prod. Co.,
Snyder, M. L., & Son, Inc.

#### Paint, Fire Resistant

Flamort Chemical Co, Horn, A. C., Co, Sub, & Div, of Sun Chemical Corp. Kelley Paint Co, Flitaburgh Plate Glass Co, Rochester Safety Equip. Co., Inc.

#### Pressure Relief Devices

Black, Sivalls & Bryson, Inc.

#### Public Address Systems

Antrex Corp.

Ampco Metal, Inc. Blackmer Pump Co.

Fisher Scientific Co.
Fyr-Fyter Co.
General Scientific Equip. Co.
Industrial Products Co.
Ingersoll-Rand Co.
New Jersey Safety Equip. Co.,
New Jersey Safety Equip. Co.,
Inc.
Seco Safety Prod. Co.
Shuder, M. L., & Son, Inc.
Thompson Mig. Ce., Inc.

#### Pumps, Foam

Cardox Div.,
Chemetron Corp.
Fyr-Fyter Co.,
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.

#### Pumps, Hand Operated

Blackmer Pump Co.

Fyr-Fyter Co.

New Jersey Safety Equip, Co.

Practical Mfg. Co.

Protectoscal Co.

Rochester Safety Equip, Co., Inc.

Thompson Mfg. Co., Inc.

Tokheim Corp.

#### Pumps, High Pressure

Bean, John, Div.,
Food Machiners & Chemical Corp.
Fyr-Fyter Co.
Ingersoil-Rand Co.
Potto Pump Inc.
Rochester Safety Equip. Co., Inc.

#### Racks, Fire Hose

Elikhart Brass Mfg. Co., Inc. Fyr-Fyter Co. Rochester Safety Equip. Co., Inc. Safety First Supply Co. Seco Safety Prod. Co. Suyder, M. L., & Son, Inc.

#### Searchlights

Carpenter Mfg. Co. Fyr-Fyter Co. McDermott, Julian A., Corp. Portable Light Co., Inc. Rochester Safety Equip. Co., Inc. Safety First Supply Co.

#### Smoker's Stand

Bullard, E. D., Co.
Davenport, A. C., & Son, Inc.
Industrial Products Co.
New Jersey Safety Equip. Co., Inc.
Safety First Supply Co.
Searjeant Metal Products Inc.
Standard Industrial Products Co.

#### Sprinkler Systems

Fyr-Fyter Co. Grinnell Co., Inc. Rochester Safety Equip. Co., Inc.

#### Syphons, Acid

Fisher Scientific Co.
General Scientific Equip. Co.
Industrial Products Co.
New Jersey Safety Equip. Co.
Rochester Safety Equip. Co., Inc.
Safety First Supply Co.,
Snyder, M. L., & Son, Inc.

#### Television, Industrial In-Plant

Blonder-Tongue Laboratories, Inc. General Precision Laboratory, Inc.

#### Training Program, Fire Prevention

Porto-Clinic Instruments, Inc.

#### Valves, Drum

Central Safety Equip. Co. Protectoseal Co.

### Watchmen's Clock Systems

Detex Watchclock Corp. Snyder, M. L., & Son, Inc.

#### Weather Warning Equipment

Crouse-Hinds Co. Kaar Engineering Co.

### Weed Killers

Bean, John, Div., & Chemical Corp.
Food Machinery & Chemical Corp.
Brulin & Co., Inc.
Dow Chemical Co.,
U.S. Borax & Chemical Corp.,
Pacific Coast Borax Co., Div.
United States Rubber Co.

#### Wetting Agent for Fire Fighting

American LaFrance,
Div. of Sterling Precision Corp.
Div. of Sterli

## Section 10 Medical and Health Service

#### Adhesive Plaster

Davis Energency Equip. Co., Inc.
Halperin, A. E., Ca., Inc.
Halperin, A. E., Ca., Inc.
Industrial Product Co.
Karel First Aid Supply Co.
Mine Safety Appliances Co.
National Mine Service Co.
Hafety First Supply Co.

#### Ambulance, Auxiliary

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